AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

MAY 15, 1957

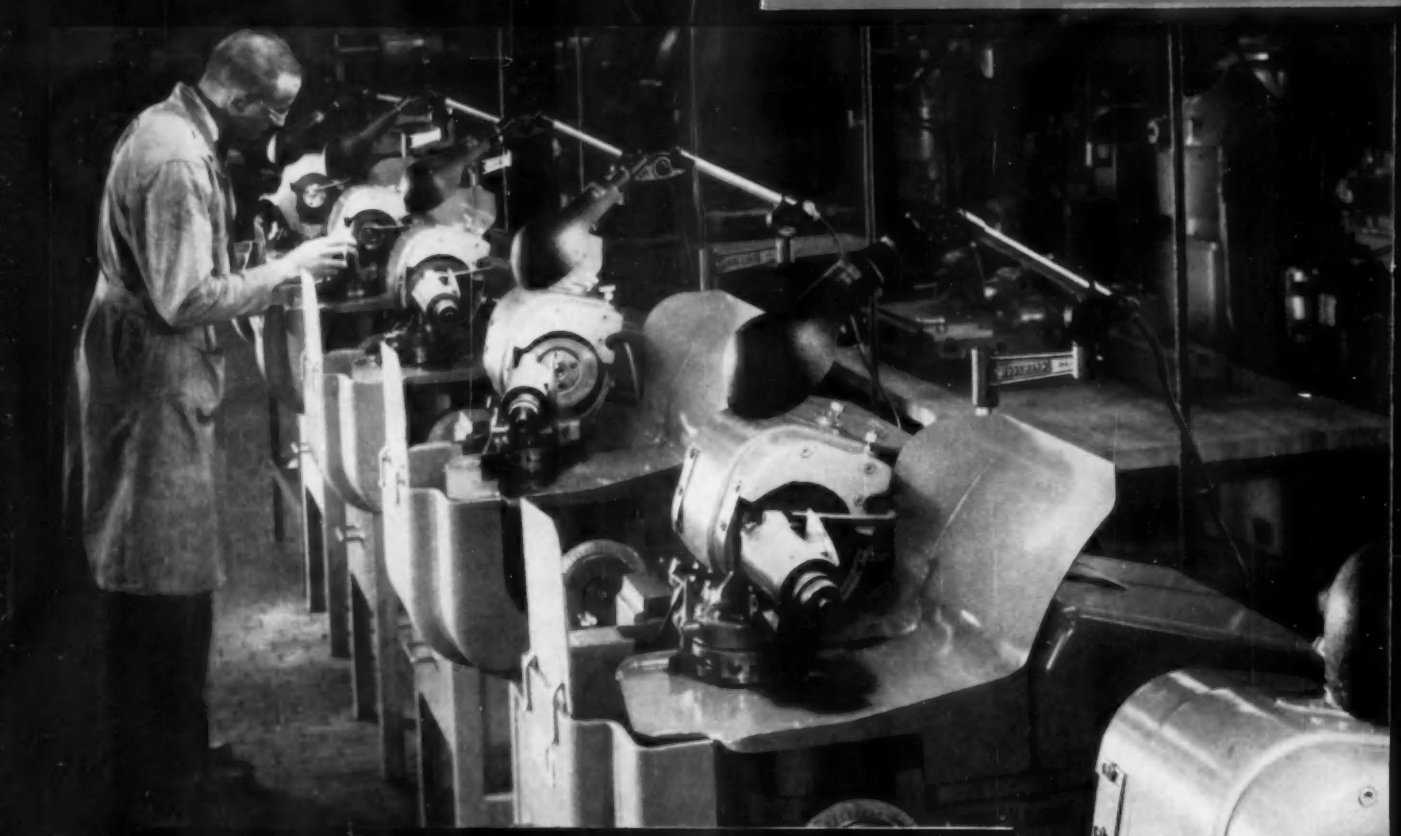
DESIGN ENGINEERING SHOW NUMBER

In This Issue

Preview of the 1957 Design Engineering Show
Forecasts of Design Changes in New Cars for '58
Making Propeller Shaft Assemblies in G.M. Plant
Smaller Cars and Engines for Indianapolis 500
Fawick-Girling Brake System for Trucks and Buses
Lead and Zinc Processors Hold Annual Meeting

COMPLETE TABLE OF CONTENTS, PAGE 3

A CHILTON PUBLICATION



How to get TOP PRECISION PRODUCTION from your Heald Bore-Matics

Sharpen your tools with Heald Precision on a Model 3 Tool Sharpener

HERE, in the plant of a large and progressive automotive manufacturer, is a "production line" for producing *precision production!* These Heald Model 3 Tool Sharpeners serve the cutting tools for a host of Heald Bore-Matics and other precision finishing machines throughout the plant.

By replacing obsolete offhand grinding methods with *machine precision*, any required tool shape can be exactly duplicated again and again. More precisely ground and *sharper* tools not only last longer — they enable you to get top precision and full production from your Heald Bore-Matics, too. After all, it's the *tool* that does the *work!* For complete information, send for Bulletin No. 2-4-2, Issue 1.

IT PAYS TO COME TO HEALD

THE HEALD MACHINE COMPANY
Worcester 6, Massachusetts
Subsidiary of The Cincinnati Milling Machine Co.
Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD ®

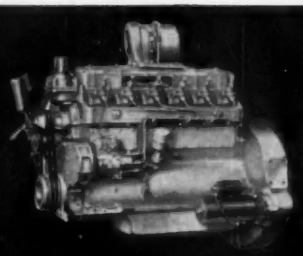
THE PAYLOAD POWER PLANT

- **fast**
- **smooth**
- **powerful**

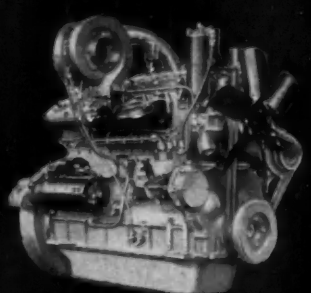
MODEL	Cyl.	*Features	Bore and Stroke	Displ. Cu. In.	Max. Torque @ RPM	Max. HP	RPM
TURBO-SUPERCHARGED DIESELS							
197-DLCS	6	AT	4 x4	320	280-2000	131	2800
135-DKBS	6	ACTV	4¼x5	426	400-1800	185	2800
148-DKBS	6	ACTV	5¼x6	779	706-1800	280	2100
WAKDBS	6	ACTV	6¼x6½	1197	1062-1600	352	1800
NORMAL DIESELS							
180-DLC	4	AC	3½x3¾	144	102-1800	45	2400
185-DLC	6	A	3½x3¾	216	152-1200	60	2400
190-DLCA	6	AC	3¾x4	265	191-1400	85	2800
195-DLCA	6	AC	4 x4	302	221-1800	98	2800
135-DKB	6	ACV	4¼x5	426	328-1600	147	2800
148-DKB	6	ACV	5¼x6	779	584-1000	200	2100
WAKDB	6	ACV	6¼x6½	1197	845-1000	258	1800
GASOLINE							
180-GLB	4	AC	3½x3¾	144	118-1600	45	2400
185-GLB	6	A	3½x3¾	216	176-1400	67	2400
190-GLB	6	A	3¾x4	265	220-1200	77	2400
195-GKA	6	ACV	4⅛x4	320	243-1600	122	3000†
MZA	6	A	4¼x4¾	404	289-1000	128	2800†
135-GKB	6	ACV	4¼x5	426	337-1200	147	2800†
135-GZB	6	ACV	4⅜x5	451	354-1200	153	2800†
140-GKB	6	ACV	4½x5½	525	425-1000	177	2600†
140-GZB	6	ACV	4⅝x5½	554	448-1100	188	2600†
145-GKB	6	ACV	5¼x6	779	595-1000	240	2400†
145-GZB	6	ACV	5⅜x6	817	630-1100	250	2400†
WAKB	6	ACV	6¼x6½	1197	1000-1000	280	1800

***FEATURES:** A—Aluminum Alloy Pistons; C—Counterbalanced Crankshaft; T—Turbo-Supercharged; V—Vibration Dampener.

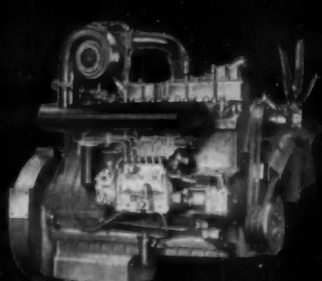
†*These engines rated at higher hp and rpm for fire engine service. Send for Bulletin 1079 for LPG ratings and complete listing of engine hp and speed ratings.*



197-DLCS—Turbocharged Diesel



135-DKBS—Turbocharged Diesel
(Also normally aspirated)



148-DKBS—Turbocharged Diesel
(Also normally aspirated)

WAUKESHA ENGINES

NORMAL and TURBOCHARGED DIESELS . . . GASOLINE . . . LP GAS
Standard or Counterbalanced Crankshafts

Truck powered by Waukesha 148-DKB Normal Diesel

Write for descriptive bulletins

WAUKESHA MOTOR COMPANY

Waukesha, Wisconsin

New York • Tulsa • Los Angeles

345

Vibration won't loosen FLEXLOC self-locking nuts

Where products must be reliable . . . must stand up under vibration, temperature extremes and hard use . . . designers specify rugged, reliable, precision-built FLEXLOC self-locking nuts.

HERE'S WHY:

FLEXLOC locknuts are strong: tensile strengths far exceed accepted standards. They are uniform: carefully manufactured to assure accurate, lasting locking action. And they are reusable: repeated removal and replacement, frequent adjustments, even rough screw threads will not affect their locking life.

Standard FLEXLOC self-locking locknuts are available in a wide range of standard sizes, types and materials to meet the most critical locknut requirements. Your local industrial distributor stocks them. Write us for complete catalog and technical data. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.

FLEXLOC® LOCKNUT DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

MAY 15, 1957 — VOL. 116, NO. 10

FEATURES

Design of Modern Cars. *By Joseph Geschelin*.... 48
Making Propeller Shaft Assemblies in Saginaw Plant, Part II. *By Joseph Geschelin* 50
Indianapolis 500 Preview. *By R. Raymond Kay*... 54
Changes Coming in '58 Cars. *By Leonard Westrate* 59
Fawick-Girling Brake System 60
Westinghouse Tool Forum. *By Charles A. Weinert* 62
Lead and Zinc Meetings. *By Kenneth Rose* 64
Ford's New Proving Ground 65
Amsterdam Show. *By Robert Braunschweig*..... 66
Vickers Hydraulic Symposium. *By Joseph Geschelin* 69
Preview of the Design Engineering Show 70
Volatility of Gasoline—a Problem 100
Industry Statistics 102

NEWS PREVIEWS

First Plymouths Shipped From Former Tank Plant 33
Chrysler Earnings Soar to Peak; GM Does Well 33
Chevrolet Expands Truck Line with New Models 34
Ford Wins Big Order for Aircraft Engines 34
Union Demands Fostering Inflation, Bugas Warns 34
AMC Cuts Operating Loss to $5.3 Million 35
Bendix-Scintilla Announces Expansion Plans 35
Republic Steel, National Lead Set Up Firm 36
UAW Launches Campaign for Shorter Work Week 36
Allis-Chalmers Sales, Earnings Dip Slightly 36
GM Shareholders to Vote on Stock Option 38
Numerous Developments Being Studied by S-W ... 38
Knudsen Still Predicts a 6.5-Million-Car Year ... 39
AF Lowers Output of Boeing B-52's and KC-135's 94
Fairchild to Make Prototype of New Aircraft... 94

DEPARTMENTS

Calendar of Coming Events 28
High Spots of This Issue 31
News of the Automotive and Aviation Industries 33
Men in the News 41
Automation News Report. *By Samuel Cummings*.. 68
Machinery News. *By Thomas Mac New* 80
New Plant and Production Equipment 83
Free Literature and Free Information Service ... 89
New Automotive and Aviation Products 92
Aviation Industries. *By Ralph H. McClarren* 96
The Business Pulse 98
Shorties 104
On Our Washington Wire 106
New Defense Facilities 176
More Defense Contract Awards 179

Business Department Staff 31
Chilton Officers and Directors 31
Advertisers' Index 266

EDITORIAL STAFF

JAMES R. CUSTER, EDITOR

H. H. ROBERTS, Engineering Editor
ANDREW SHEARER, News & Markets Editor
ROBERT P. HOMER, Editorial Production Mgr.
MARCUS AINSWORTH, Statistical Editor
CHARLES A. WEINERT, Associate Editor
SAMUEL CUMMINGS, Assistant Editor
DIANE DAVIS, Art Editor
HOWARD KOHLBRENNER, Art Director

DETROIT
Joseph Geschelin, Detroit Editor
Edward Janicki, Associate Ed., Detroit

PHILADELPHIA & NEW YORK
THOMAS MAC NEW, Eastern Editor

WASHINGTON
George H. Baker, Washington Editor
Ray M. Stroupe, Washington News Editor
Neil R. Regeimbal, Washington News Ed.

CHICAGO
Kenneth Rose, Midwest Editor

LOS ANGELES
R. Raymond Kay, Pacific Coast Editor

BERN
Robert S. Braunschweig, European Correspondent

LONDON
David Scott, British Correspondent

Paul Wooton, Washington Member, Editorial Board

As part of its worldwide automotive and aviation news coverage, AUTOMOTIVE INDUSTRIES is serviced by International News Service and has editorial correspondents in major United States and foreign industrial centers.

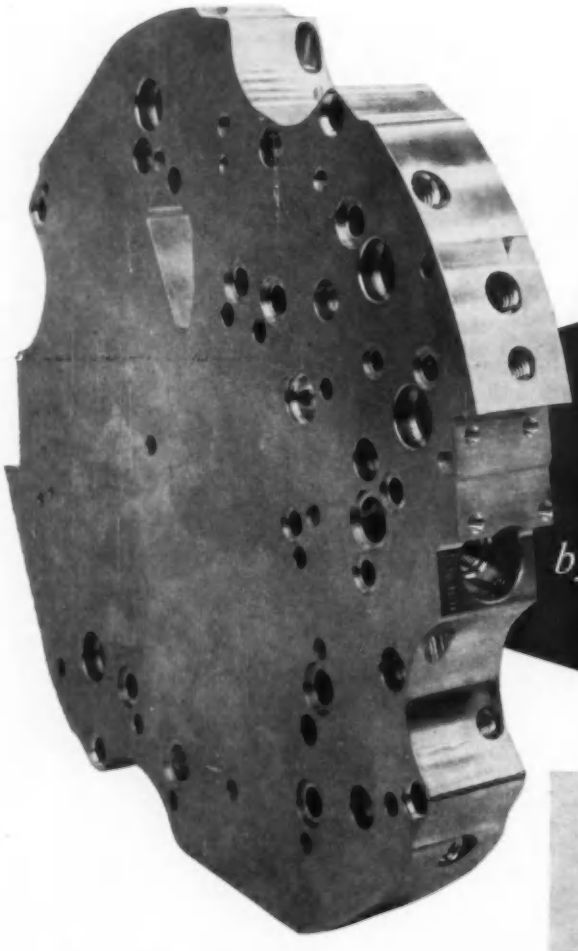
MEMBER — Society of Business Magazine Editors — National Business Publications, Inc. — Audit Bureau of Circulations

Copyright 1957 by Chilton Company

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

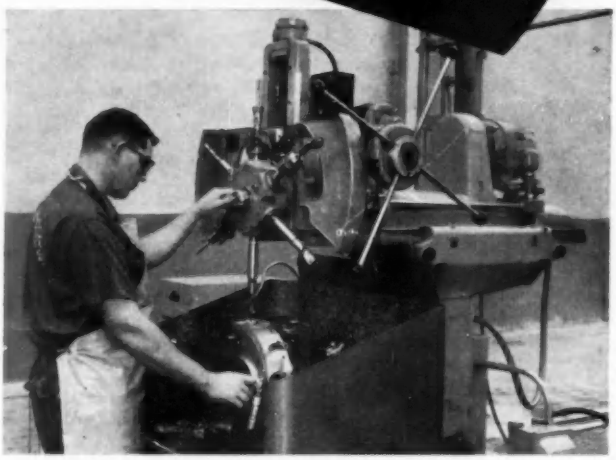
EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, United States Possessions, 1 year $2.00, 2 years $3.00. Canadian and Foreign, 1 year $5.00, 2 years $8.00; Statistical Issue (Mar. 15th), $1.00.



CONVAIR *Brand* *SWISS CHEESE* *by* BURGMASTER® turret drills

Here's how CONVAIR managed this precision work: "The manifold consists of a multi-hole pattern in a magnesium disk over one foot in diameter and almost two inches thick. These holes, to be produced on both faces and the periphery, varied both in depth and diameter, requiring many single and combination tools and taps; all to be held to close tolerances. The solution to this task was found in a tandem of three ram type BURGMASTER radial turret drills. These versatile machines allowed us to produce all the required machining with a minimum of set-up, tooling, operation time, transfer time and maintenance."

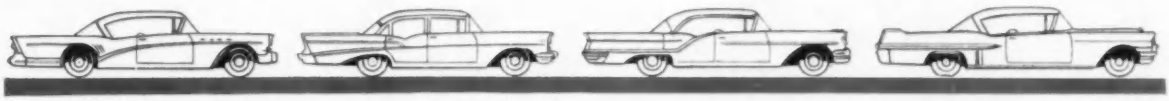


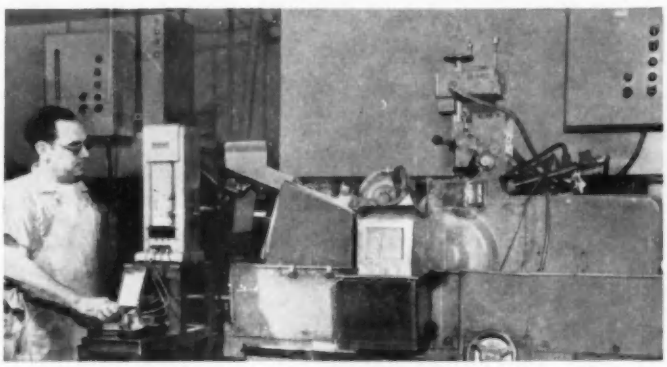
The Burgmaster Model 2 BR (6 Spindle) Ram Type Radial Turret Drill with Automatic Power Clamping features power indexing and a new sensitivity in handling. When the ram is clamped in position, the 2 BR can function as a deep throat production turret drill, easily handling holes up to ¾″. The machine has a 250° radial movement with maximum and minimum radii of 42″ and 15″, respectively.

For complete details, write Dept. AI-5

BURG TOOL
MANUFACTURING COMPANY, INC.
15001 S. Figueroa St., Gardena, Calif.
Ridgewood, N. J., Cleveland, Detroit, Chicago, San Leandro, Calif.

When you think of tapered roller bearings think of HYATT





Trend gage for servo control of size on race O.D. grinding operation

—the home of ELECTRONIC QUALITY CONTROL!

Nearly half of all American cars and trucks built today have HYATT Hy-Roll Tapered Bearings

For decades, the name HYATT has stood for highest quality in roller bearings. Today, it means *even higher* quality—because now HYATT craftsmen have the last word in electronic controls to help them produce tapered bearings with *greater uniformity than ever before achieved in quantity production.*

Today's HYATT Hy-Roll Tapered Bearings help assure smoother, more dependable performance than you could ever build into your tapered bearing applications before. If you want the *best*, you want HYATT Hy-Roll Tapered Bearings! Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

GM GENERAL MOTORS

Watch "WIDE WIDE WORLD" Sundays on NBC-TV

HYATT HY-ROLL BEARINGS FOR CARS AND TRUCKS

NOW...an aluminum wheel with integral hub and drum designed for casting

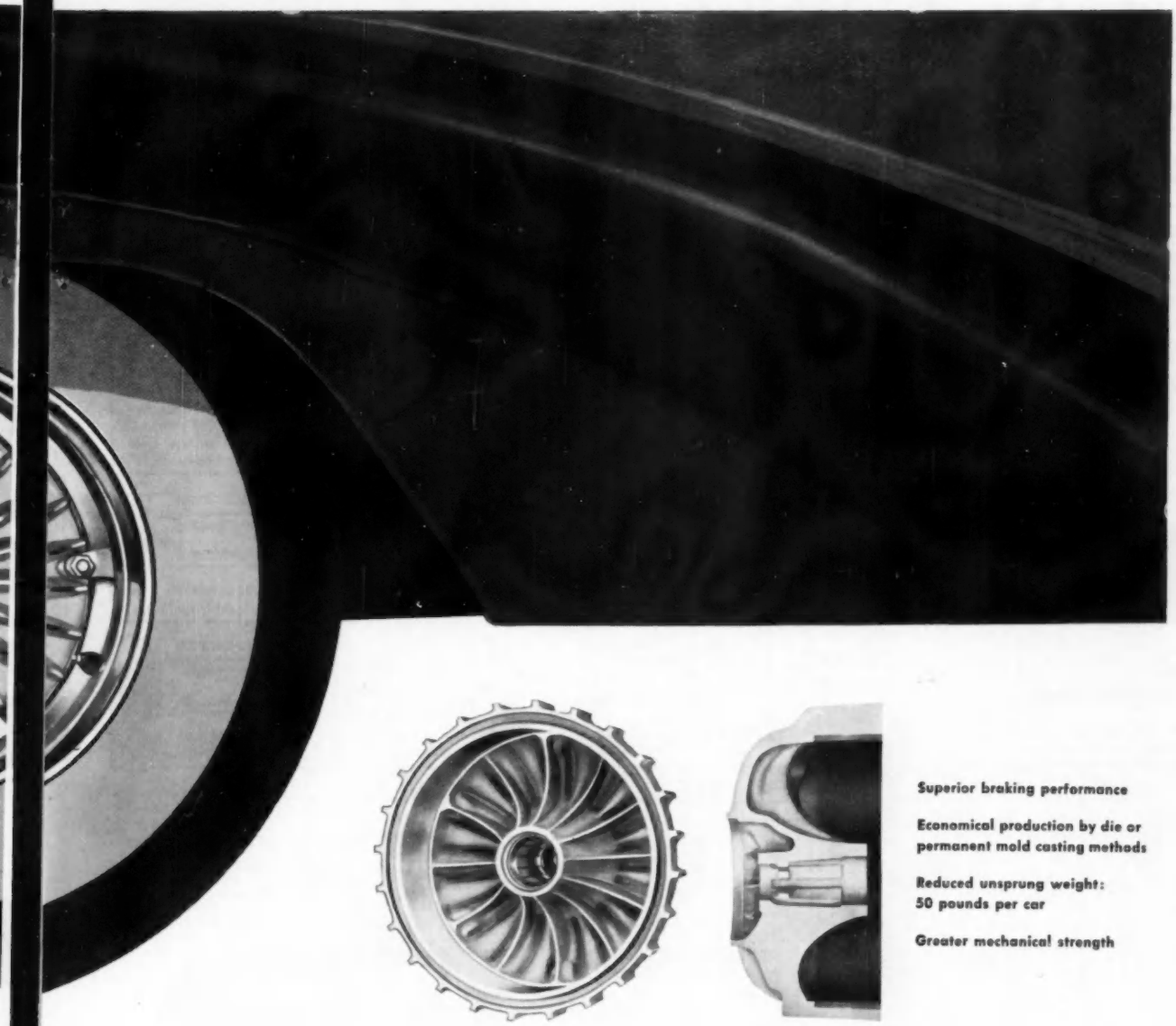
ANOTHER KAISER

Kaiser Aluminum now offers the automotive industry a unique design for an aluminum passenger car wheel that can be economically cast—the product of two and one-half years of design and development.

The design combines wheel disc, hub and brake drum into a single casting with unique advantages in braking performance, production economy, weight and strength:

Production economy: The die or permanent mold casting method renders mass production of the wheel economically practical and lends itself to an infinite variety of attractive styling variations.

Braking performance: Dynamic and brake dynamometer tests indicate that the performance of this aluminum wheel far surpasses accepted standards. Tests show substantially less brake fade—due to aluminum's high heat conductivity,



Superior braking performance

Economical production by die or permanent mold casting methods

Reduced unsprung weight: 50 pounds per car

Greater mechanical strength

ALUMINUM PARTNERSHIP PROJECT WITH THE AUTOMOTIVE INDUSTRY

direct flow of heat to cooling fins and virtually unrestricted passage of cooling air over heat-dissipating surfaces. The actual braking surface is a ferrous metal liner held in place or bonded by any of the accepted commercial methods.

Weight: A prototype wheel with rim weighs only 30 pounds as compared to 42.6 pounds for a steel wheel, hub and brake drum assembly. This saving—12.6 pounds or about 30 per cent—makes possible greatly reduced unsprung weight, improved riding characteristics, better over-all performance.

Strength: Design of the wheel combines wheel disc and hub for greatest strength at least weight, and at the same time exposes ample surface area for efficient air-cooling. The design also minimizes the contact area between the demountable rim and the aluminum casting; this restricts the direct heat flow to the rim, thereby increasing the tire life.

Kaiser Aluminum *does not* manufacture the cast aluminum wheel; but *does* work as idea partner to the automotive industry, helping introduce better parts at lower cost through developments in aluminum.

Our Automotive Development engineers are available to work with you on applications of the cast aluminum wheel ... as well as to help you on other specific requirements and problems in aluminum alloy selection and fabrication.

For further information, call our Automotive Industry Division, TRinity 3-8000, Detroit. Kaiser Aluminum & Chemical Sales, Inc., 2214 Fisher Bldg., Detroit 2, Michigan.

Kaiser Aluminum

See "THE KAISER ALUMINUM HOUR." Alternate Tuesdays, NBC Network. Consult your local TV listing.

over 14,000 8,000 Different Cylinder SELECTIONS

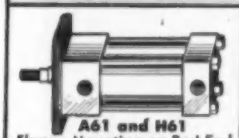
Miller AIR AND HYDRAULIC

"STANDARDIZED" CYLINDERS "IN STOCK" for immediate delivery...

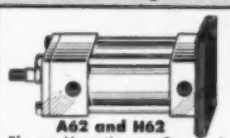
See Miller Bulletins A-105 (Air) and H-104 (Hydraulic) for Complete Dimensions and Engineering Data on these standardized "in stock" sizes and other Custom Miller Cylinders in bores up to 20" and strokes up to 22 ft.

"IN-STOCK" MODELS

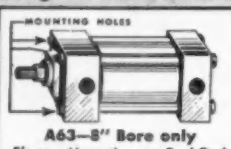
"A" Signifies Miller 200 psi Air Cylinders; "H", 2000 psi Hydraulic Cylinders. Interchangeable Mountings Are Shown In Red On Drawings.



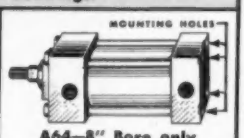
A61 and H61 Flange Mounting on Rod End (A61 not available in 8" bore)



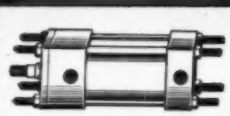
A62 and H62 Flange Mounting on Cap End (A62 not available in 8" bore)



A63—8" Bore only Flange Mounting on Rod End

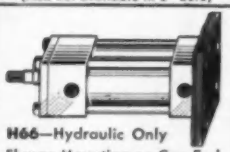


A64—8" Bore only Flange Mounting on Cap End

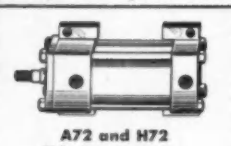


A50 & H50—Tie Rods not extended beyond nuts.
A51 & H51—Tie Rods extended both ends (shown).
A52 & H52—Tie Rods extended. Cap End only.
A53 & H53—Tie Rods Extended. Rod End only.
A54 & H54—Two Tie Rods extended at both ends.

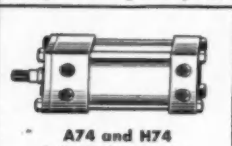
H65—Hydraulic Only Flange Mounting on Rod End



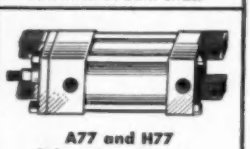
H66—Hydraulic Only Flange Mounting on Cap End



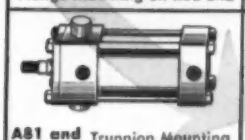
A72 and H72 Side Lug Mounting



A74 and H74 Side Flush Mounting

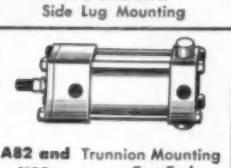


A77 and H77 Side or Foot Mounting

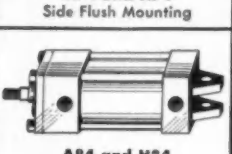


A81 and H81 Trunnion Mounting on Rod End

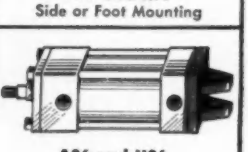
Your Choice of
CAP END CUSHIONED
ROD END CUSHIONED
or
BOTH ENDS CUSHIONED
on all cushioned strokes of all bores shown.



A82 and H82 Trunnion Mounting on Cap End



A84 and H84 Pivot Mounting



A86 and H86 Pivot Mounting

IN STOCK BORES (in inches)

	Bores	Rod Dia.	Rod Turn Down & Threads		"IN-STOCK" STROKES (in inches)																					
AIR	1½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12										
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12										
	2	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	2½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	3¼	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	4	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	5	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	①
	6	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	8	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	④
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
HYDRAULIC	1½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12										③
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12										
	2	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	②
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	2½	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	3¼	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	4	1¾"	1¼-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	5	2"	1½-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	

① "A" and "H" Models 82, 84 and 86 with strokes over 18" require stop tubes.

Column strength requires larger diameter piston rods for the following:

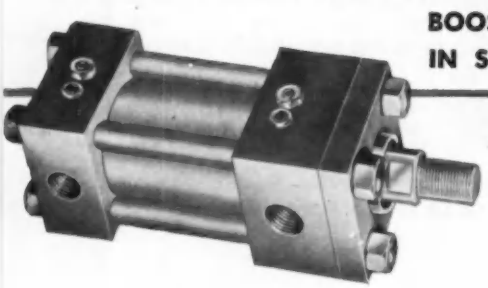
Air Cylinder Models A82, 84, and 86 with strokes inside area (1), when operated at 100 psi and over;

All hydraulic models with strokes inside area (2) and Models H82, 84, and 86 with strokes in area (4), when operated at 2000 psi and over;

Models H82, 84 and 86 with strokes inside area (3), when operated at 1000 psi and over.

Depending upon Trunnion Pin location, "A" and "H" Models 83 with standard diameter piston rods can have longer strokes than Models 82, 84 and 86.

See Miller File #251 for oversize piston rod and stop tube requirements.



BOOSTERS IN STOCK

Immediate Delivery on the following Miller 25 to 1 Ratio Boosters (80 psi air input produces 2000 psi hydraulic oil output): Model B4, 5" bore, 1" dia. ram, 6" and 12" strokes; Reciprocating Booster Model DA77-RBA8, 5" bore, 1" dia. ram, 6" stroke. Also Booster Tanks, 5" dia., 6" and 10" heights.

Write For Catalog and Stock Price List

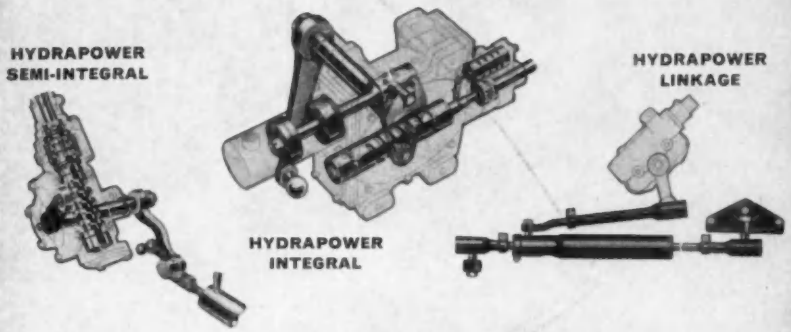
Miller

Miller · FLUID POWER DIVISION
Flick-Reedy Corp

2028 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

POWER STEERING



▶ **For your** vehicle, which type of hydraulic power steering will provide maximum steering ease, safety and serviceability at lowest cost? *Semi-Integral? . . . Integral? . . . Linkage?*

Ross engineers are prepared to answer this question in terms of *one* responsibility from design to completed unit—because Ross makes *all three* types—in dependable, effortless, economical *Ross Hydrapower.*

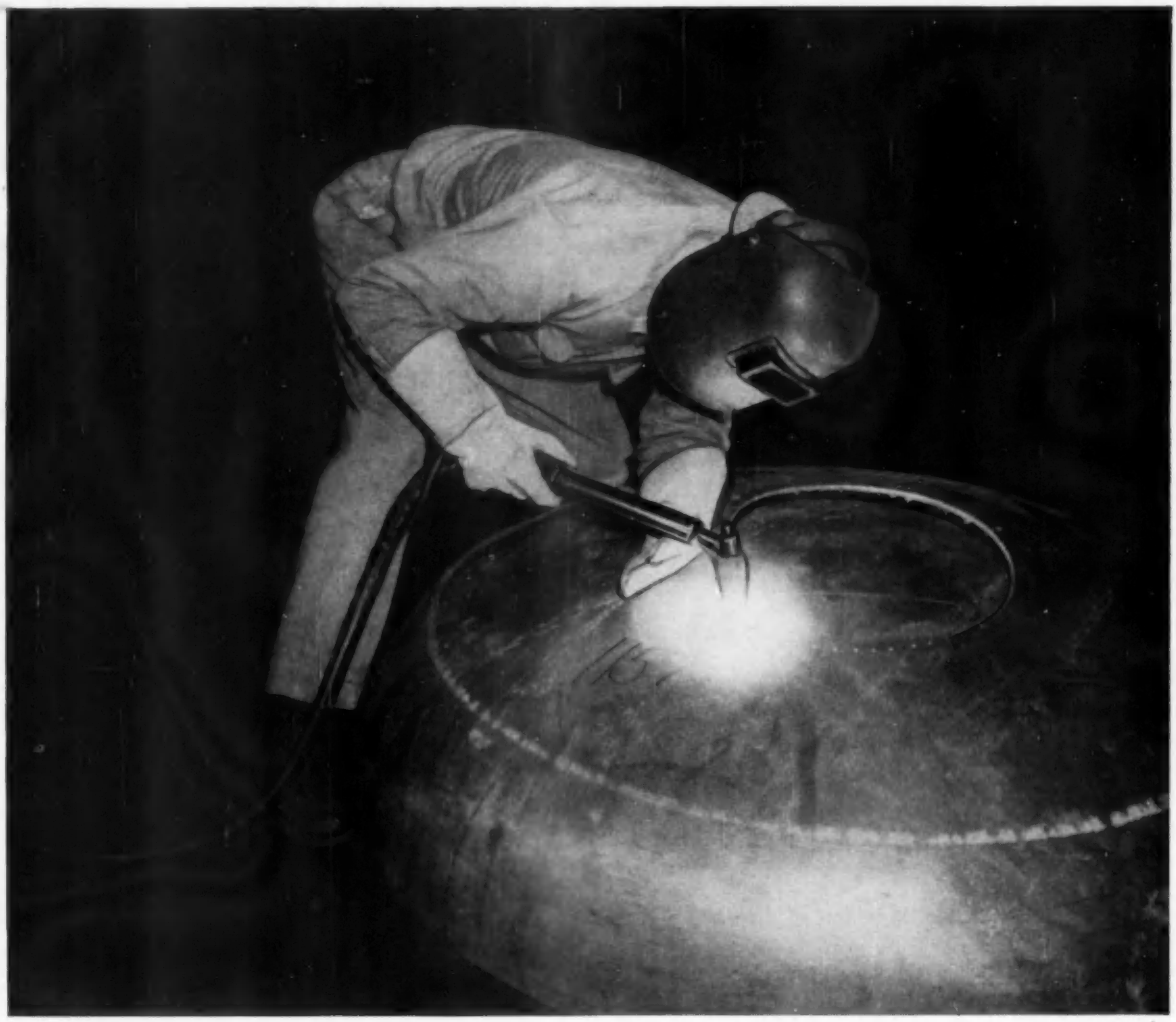
Ross invites discussion of *any* steering problem—manual or power.

ALL 3 TYPES FROM 1 SOURCE

Ross HYDRAPOWER

ROSS GEAR AND TOOL COMPANY, INC. · LAFAYETTE, INDIANA

Gemmer Division • Detroit



from one hour to one minute...

HELIARC Cutting Whizzes Through Aluminum

One of the first aluminum fabricators to use LINDE's new HELIARC cutting process reveals savings of more than 95 per cent over conventional chipping methods—jobs normally requiring 1 and 5 hours to complete are whisked through in only 1 and 4½ minutes respectively. Graver Tank and Manufacturing Company reports beveling, grooving, shaping, and cutting are all performed on ⅝-in. thick, 52S aluminum plate at substantial time, space, and cost savings.

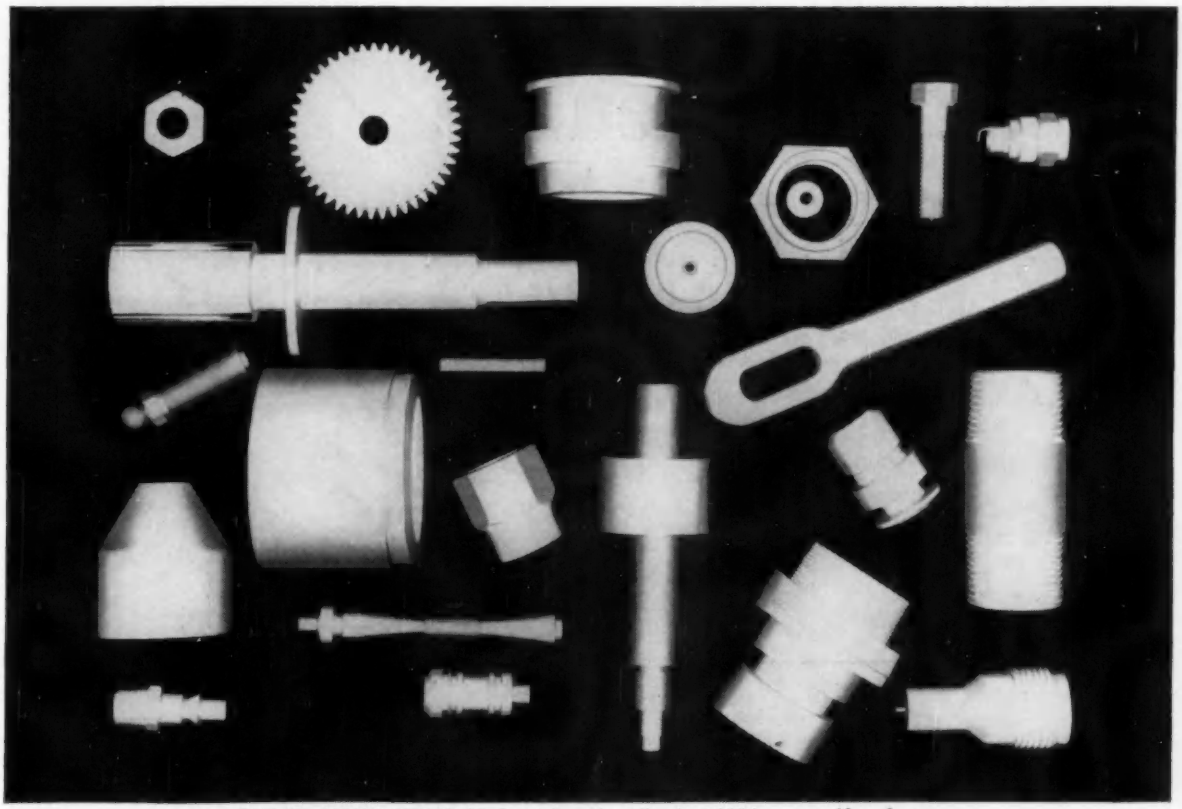
Incredible, but true: HELIARC cutting can attain speeds as high as 600 inches per minute, and cut aluminum in thicknesses up to 1½ inches. No special skill is required. A certified welder can do excellent cutting jobs after less than one hour of instruction.

Get the full story on revolutionary new HELIARC cutting. Call your LINDE representative, or write for free illustrated literature, Form 50,095.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

"Heliarc" and "Linde" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde
Trade-Mark



ONE OIL, MANY METALS. Moderately priced Sunicut 5534 gave uniformly excellent results in the machining of this wide variety of top-quality steel parts.

Designed especially for job shops...

NEW SUNICUT 5534 CAN BE USED ON A WIDE VARIETY OF STEELS

SUNICUT® 5534 ends your search for a single cutting oil that can assure quality machining of a wide variety of ferrous metals...ranging from B1112 to 4130 and including free-machining stainless steels.

A non-emulsifying, transparent cutting oil, Sunicut 5534 can speed production of general screw machine and turret lathe work. It gives excellent finish in tapping, drilling, threading, and light stamping operations and can be used on many special jobs run at both high and low speeds.

Try moderately-priced Sunicut 5534. It can save you money by reducing your cutting oil inventories and oil change time. It can boost your production and profits.

For detailed information, prices and delivery data about this new, versatile cutting oil, call your Sun representative today. Or write directly to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-5.

SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

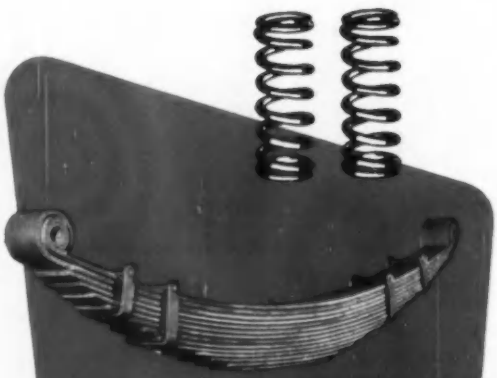
SUN OIL COMPANY Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

©SUN OIL COMPANY

What to do when the BUBBLE BREAKS

Trucks, buses, trailers, tractors, off highway equipment, and private motor cars of almost every prominent make use Burton Leaf or Coil springs as original equipment.

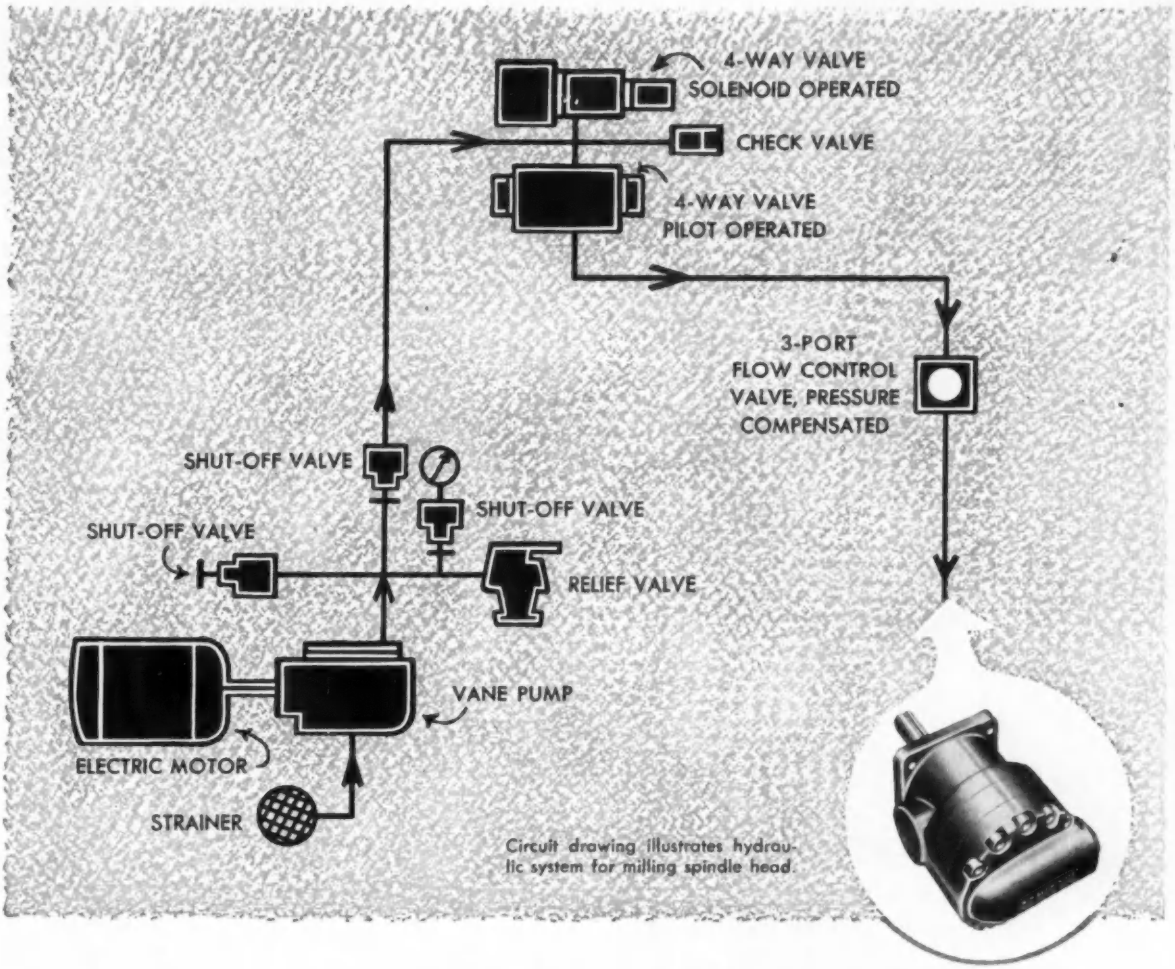


When you want reliability ...dependability...specify Steel Springs. Come to Burton to get them!

It all looks very pretty . . . then POW . . . those plans that looked so good on paper turn out worse than worthless when they're on the road. That's why correct engineering is so important in the automotive industry.

For many years, Burton Spring engineers have made a specialty of translating engineering ideas into the sound reality of tempered steel. Steel Springs not only offer a time-tested way to absorb road shocks, but they possess inherent structural qualities that make for stability and endurance in the entire vehicle. They not only soften and control vertical motion, but efficiently control lateral and longitudinal "play," side sway and rocking.

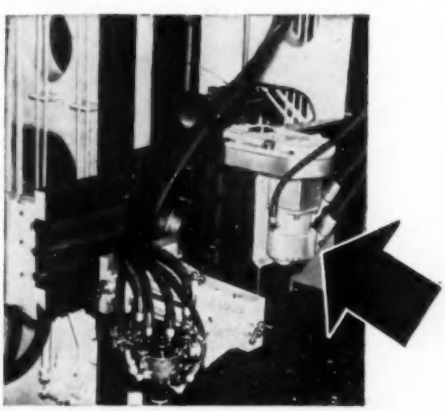
BURTON AUTO SPRING CORP.
. . . Vital Support for the Automotive Industry . . .
WESTERN AVENUE AT FORTY-EIGHTH STREET • CHICAGO 32, ILLINOIS



Circuit drawing illustrates hydraulic system for milling spindle head.

Developing a compact, efficient spindle head

...another application for Denison hydraulic power



Denison hydraulic motor is mounted directly to gear case of spindle and powers driver gear of the gear train.

THE PROBLEM: to develop a compact, efficient milling spindle head with infinitely variable spindle speed and instantaneous speed selection.

For True-Trace Sales Corporation of El Monte, California, the solution involved the use of hydraulic power... and Denison hydraulic equipment.

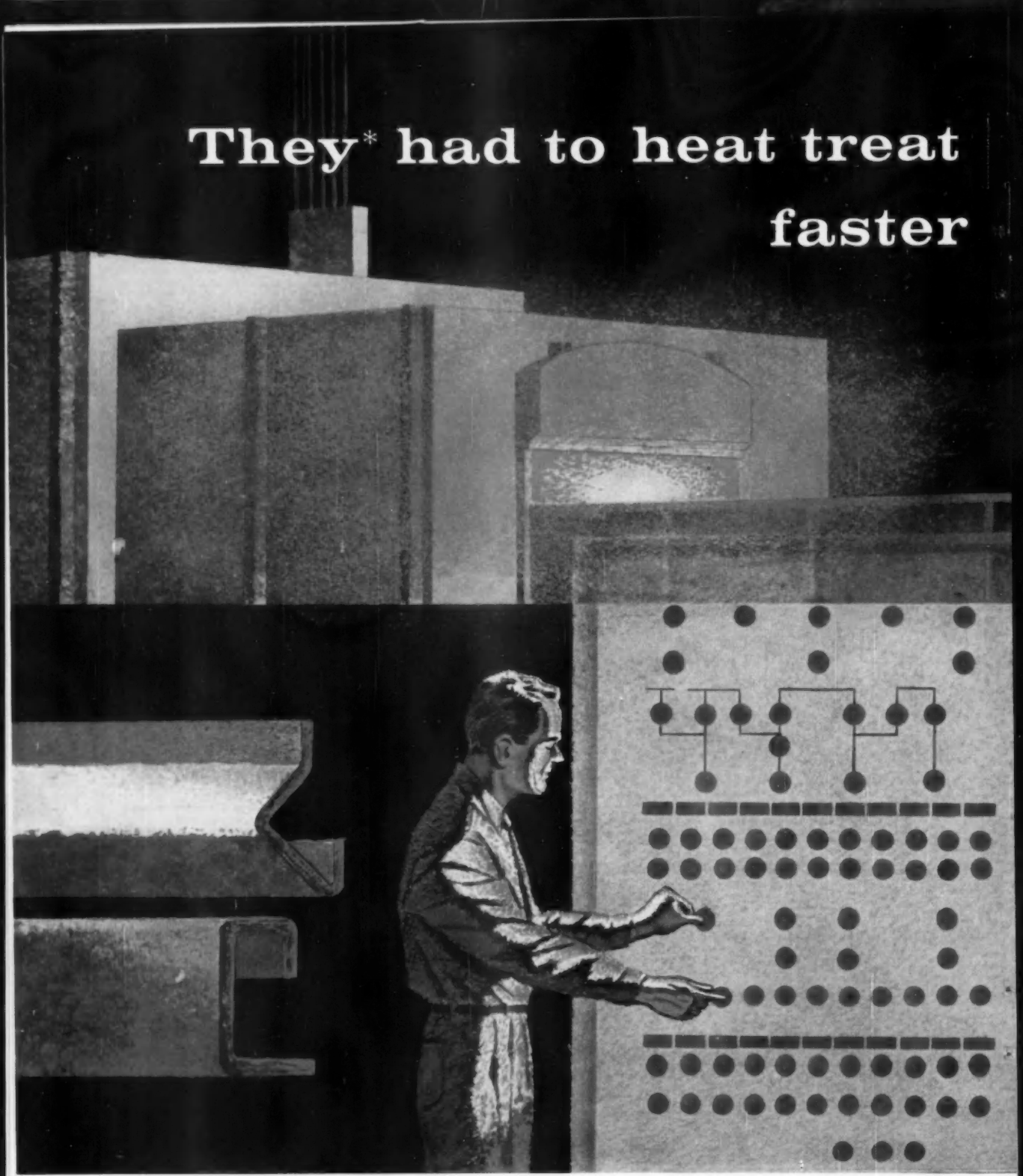
The result was spindle with a 15 hp rating and speeds up to 3000 RPM. To drive the spindle, True-Trace selected a Denison TMC-3 fluid motor. Variable speed control is achieved with a Denison 3-port flow control valve. The control's nine separate ranges permit exact speed selection by the operator.

Let a Denison hydraulic specialist help you with your design problems. Write Denison Engineering Division, American Brake Shoe Co., 1212 Dublin Road, Columbus 16, Ohio.

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

DENISON HydrOILics

They* had to heat treat faster



***RESULTS: A better way to anneal extrusions** In a major aluminum plant, it used to take 3 men 8 hours to load and anneal 3600 lbs. of extrusions in a conventional, vertical furnace.

Today a Westinghouse horizontal, roller-hearth furnace and work handling system automatically handle and anneal the same charge in two-thirds the time with only two operators. Westinghouse engineered all equipment to coordinate with increased production. From a single operator station, heat and quench cycle variables are quickly programed for every batch of extrusion shapes.

...do you?

Furnace maintenance and work handling costs can eat up the profit from increased production. Over 40% of the furnaces in operation today are obsolete . . . at least 60% are twenty years old. When you have to heat-treat faster, it makes sense to specify Westinghouse equipment, developed to keep production profitable.

Westinghouse engineering puts complete equipment answers in your hands . . .

Our engineers design complete heat-treating systems using gas or electric furnaces or induction heating. From a single source you get the latest equipment answers to coordinate work handling, complete control, atmosphere preparation, furnace design and construction, quenching arrangements and safety precautions.

. . . with these flexible, timesaving steps

1. Start by calling in your local Westinghouse industrial heating representative. His analysis and on-the-spot suggestions develop your objectives.

2. Engineering and metallurgical specialists bring together equipment designed to meet your objectives.

3. Westinghouse Metallurgical Research Department and Metals Pilot Plant may be called on for process improvements or test runs under simulated conditions.

4. Westinghouse complete responsibility for your heat-treating system does not end until operation checks out your personnel in actual use.

This is another example of the way Westinghouse helps you POWER-UP . . . to get better production and profit from your electrical dollar. Call in your Westinghouse representative today, or write Westinghouse Industrial Heating Division, Meadville, Pa.

J-10461

NEW . . . Westinghouse 20-page book, *Metals Heating—Gas, Electric, and Induction.* Write for your copy to Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE **SURE**...IF IT'S

Westinghouse

Precision Requires Gages

THAT'S WHY FEDERAL OFFERS

Just *any* gage is not good enough when you want to check a dimension for accuracy. Some dimensions require a higher degree of accuracy than others. And some dimensions cannot be reached directly. Still others need ranges or adjustments to give greater gage capacity.

Inside and Outside CALIPER GAGES

Ideal for measuring difficult dimensions. Specially shaped arms of various lengths can be designed to reach inaccessible spots or get around obstructions.

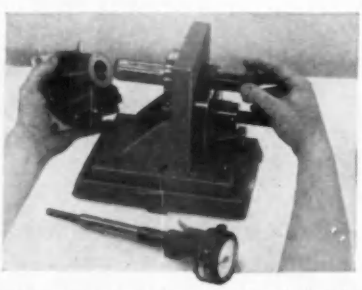
Odd Shaped Jaws for Unusual Applications

Limitless variety of jaw shapes permit measurements impossible with any other type of gage.

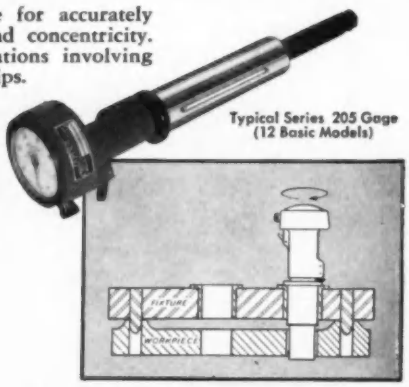
HOLE LOCATION GAGES

Series 205 Gages provide for accurately checking hole location and concentricity. Also adaptable to applications involving hole and surface relationships.

Squareness and location of holes in three mating parts of pump housing are checked to determine alignment within .0001".



Two small and one large hole are checked for parallelism with each other.



Typical Series 205 Gage (12 Basic Models)

Hole location with respect to a predetermined reference and squareness of hole axis to a locating fixture.

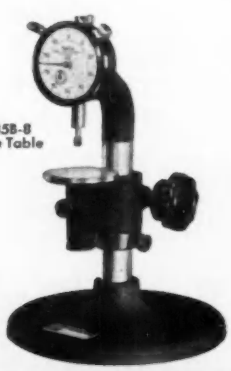
BENCH TYPE THICKNESS GAGES and Small Comparators

Model 691B — Deep throat for ample clearance. Weight for compressible materials, applied directly through indicator spindle assures uniform measuring pressure.

Model 57B-1
Long 1" Range

Model 35B-30
Adjustable capacity

Model 35B-8
Adjustable Table



to Suit the Job...

SUCH A VARIETY OF GAGES!

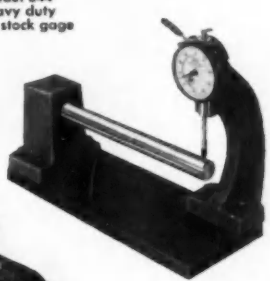
It's easy to check a dimension with a Federal Gage — and it's the quickest and least expensive way. Just call Federal and get the *right* gage for your job.

FEDERAL PRODUCTS CORPORATION
7265 EDDY STREET, PROVIDENCE 1, R. I.

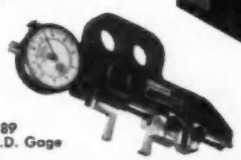
WHATEVER YOU NEED IN GAGES

Ask **FEDERAL** *First*

Model 644
Heavy duty
sheet stock gage



Model KB-410
Deep Throat, Adjustable



Model 22P-189
Adjustable I.D.—O.D. Gage

Model 22P-20
Deep Throat, Long Range

THICKNESS GAGES

Many styles and sizes, for portable and bench use.

Model 22P-10

Model 26P-7
Hand-grip

Model KP-120
Deep Throat, Portable

Model 1308
Electronic Comparator
0" to 7½"
Magnifications to 15,000x

Model 1208-1
The "Microset" Comparator
0" to 8"

OVER 10 TYPES OF COMPARATORS

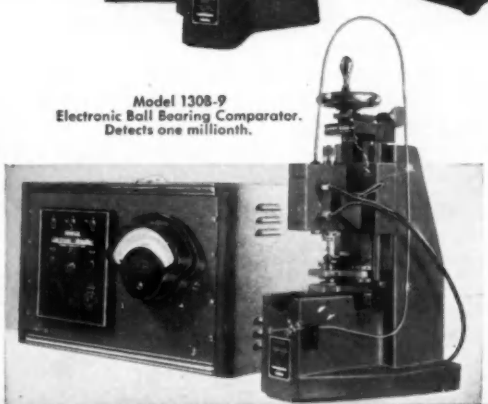
Model NB-60
General purpose Comparator

Model 136
I.D. — O.D. Electronic
Master Comparator
Detects one millionth

MANY OTHER TYPES

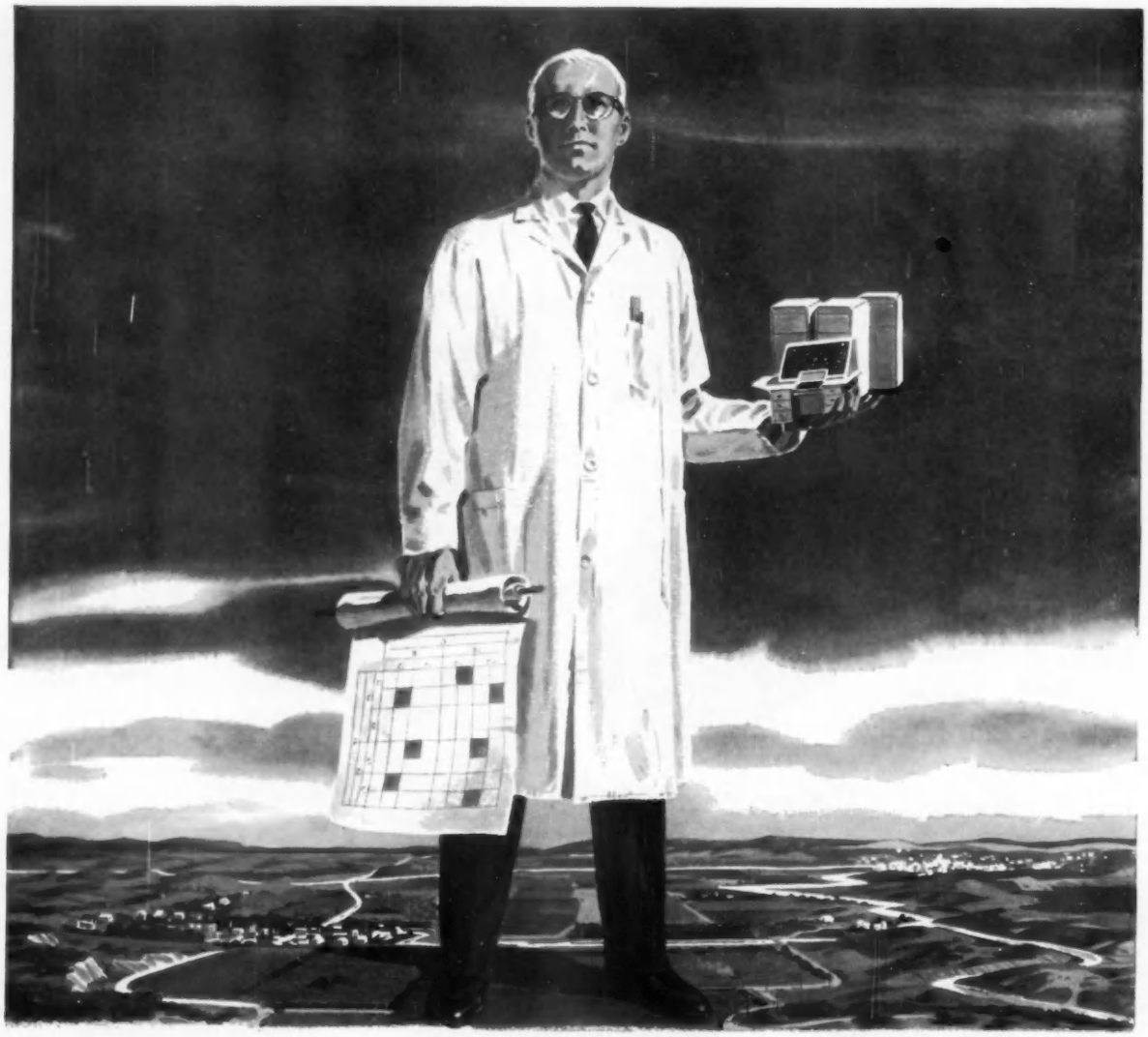
SEE ALSO NEXT PAGES

Model 1308-9
Electronic Ball Bearing Comparator.
Detects one millionth.



Send for Catalog illustrating world's most complete line of Dial Indicator Gages.

GAGES CAN BE SPECIALLY MODIFIED TO SUIT



Latin Square, Univac and 36 years experience

all three help assure National Seals are best engineered

Univac you know, experience you know; the Latin Square? An ancient, half-forgotten solver of problems having many variables. Today, National Seal engineers use it to reduce exploratory engineering time as much as 75%.

Old, new, time-tested and visionary—National Seal engineers embrace every approach that can help keep National Seals the best engineered in America. Results have been good. Syntech®, the milestone in synthetic rubber seals and Micro-Torc®, major forward step in leather seals, are but two examples.

National Seal's advanced engineering, in plant or field, is ready now to help you solve sealing problems. This help is yours for a telephone call.

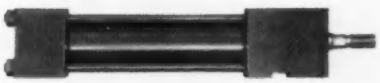
VITAL: Whatever seals you buy, save trouble and expense later on by specifying them "on the board." For safety, have specifications checked by a National Seal engineer.

NATIONAL SEAL Division, Federal-Mogul-Bower Bearings, Inc.
General Offices: Redwood City, California; Plants: Van Wert, Ohio, Redwood City and Downey, California

36th Year

National Field Engineers At Your Service: Chicago, Ill., Room 462, McCormick Building, HArrison 7-5163 • Cleveland, Ohio, 210 Heights Rockefeller Bldg., YEllowstone 2-2720
Dallas, Texas, 2520 West Mockingbird Lane, FLeetwood 2-7541 • Detroit, Mich., 13836 Puritan Avenue, VErmont 6-1909
Downey (Los Angeles Co.), Calif., 11634 Patton Rd., TOpaz 2-8163 • Indianapolis, Indiana, 2802 North Delaware St., WAlnut 3-1535
Milwaukee, Wis., 647 West Virginia St., BRoadway 1-3234 • Newark, N. J., 1180 Raymond Blvd., MItchell 2-7586

4228



Five cylinder series... each the best of its kind!

Here you see one more reason why experienced cylinder users prefer Hannifin cylinders...there is a Hannifin cylinder series for every type of service.

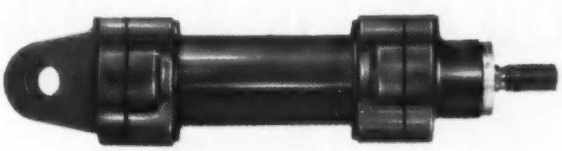
What pictures cannot show you is the extra effort that goes into every Hannifin cylinder, all the way from the drawing board to the shipping dock. This brings you design features other cylinders simply do not have...superior workmanship where it's most needed for long, trouble-free service...and better delivery promises, better kept. All at prices no higher than you may have been paying for less satisfactory cylinders.

There's a Hannifin man near you—or, if the need is urgent, call us long distance. He or we will welcome the opportunity to help you as you select the Hannifin cylinder series that best meets your needs.

AIR AND HYDRAULIC

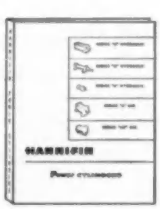
HANNIFIN

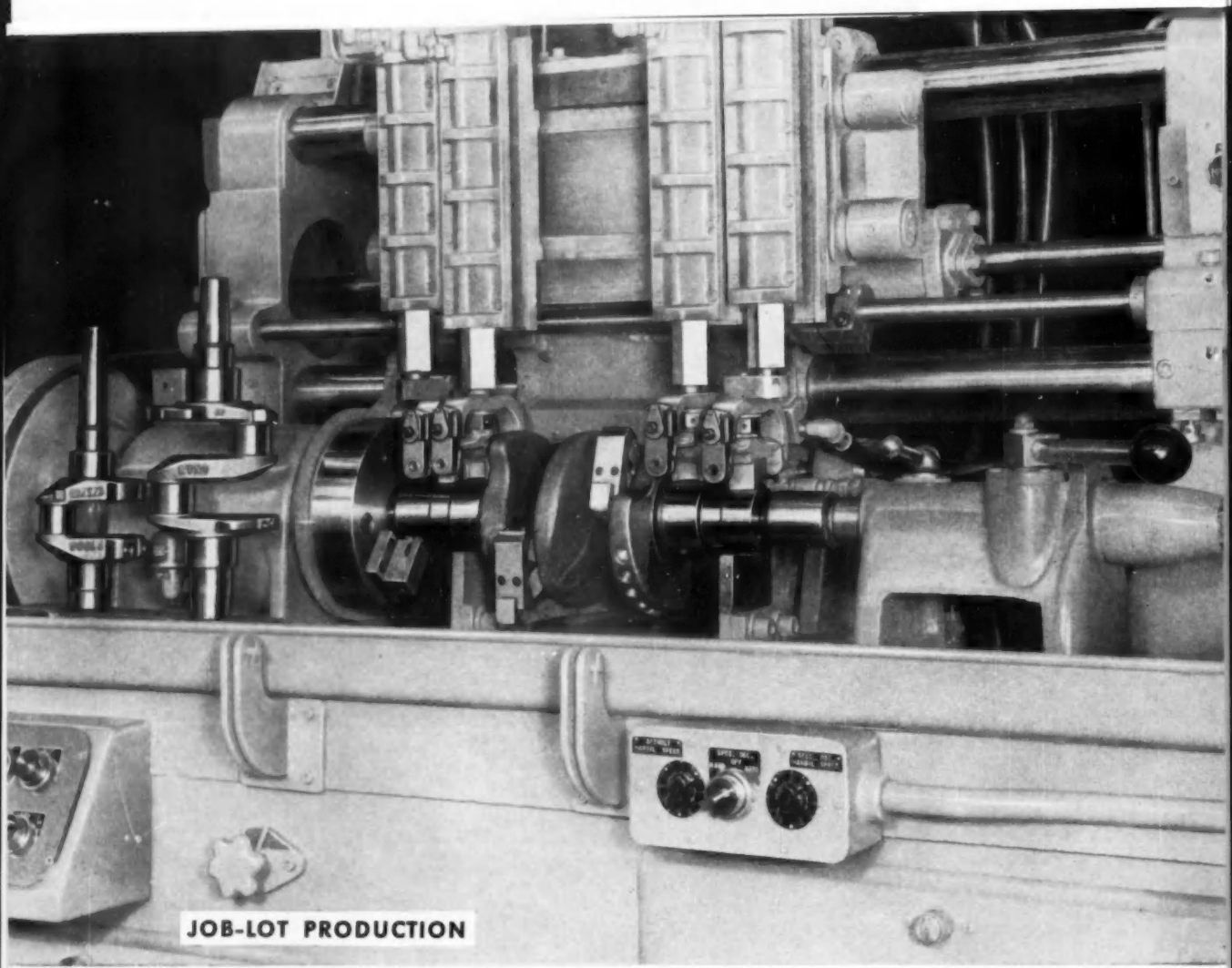
POWER CYLINDERS



COMPLETE CYLINDER FILE

Write for your copy of this new Hannifin Cylinder File . . . complete, easy-to-use, easy-to-order-from information on five lines of Hannifin cylinders. Write Hannifin Corporation, 543 S. Wolf Road, Des Plaines, Illinois.

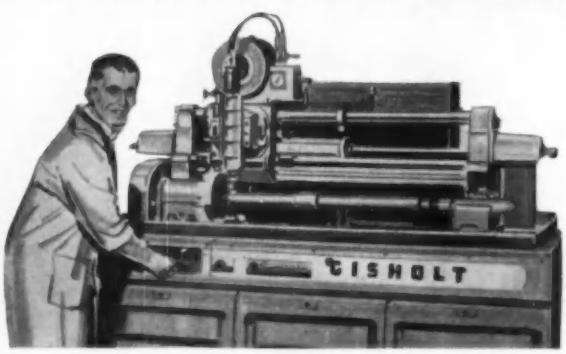




No. 51A General Purpose Superfinisher

CRANKSHAFTS in small job-lots are Superfinished with this setup—holding the piece between centers and driving from a keyway with a faceplate driver. Latch-on follower-type arms Superfinish the crank pins, while the main bearing and oil seal surfaces are Superfinished by standard overhead quills. Main and pin bearings are taken from a ground surface of 30 micro-inches down to 8 or less. Oil seal surfaces on shaft ends are Superfinished to 4 or less. Production: 44 to 53 pieces per hour at 80% efficiency.

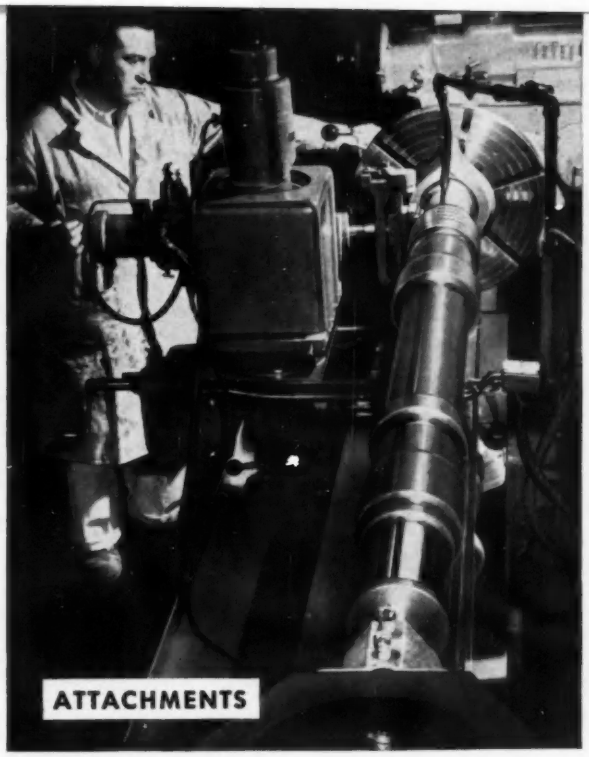
NEED SMOOTHER SURFACES AT LOW COST? See the



BEEN LOOKING FOR AN INEXPENSIVE PROCESS to improve product quality—to help market your product easier against increasing competition?

Gisholt Superfinishing may well be your answer ...it has been for some time for a long list of leading manufacturers.

With this modern process, you'll definitely reduce —or even eliminate—the cost and time of grinding, polishing or buffing operations. With the exclusive Gisholt Superfinishing method, you utilize a "scrubbing" effect through an abrasive stone which oscillates as the work rotates. Chatter marks, grind-



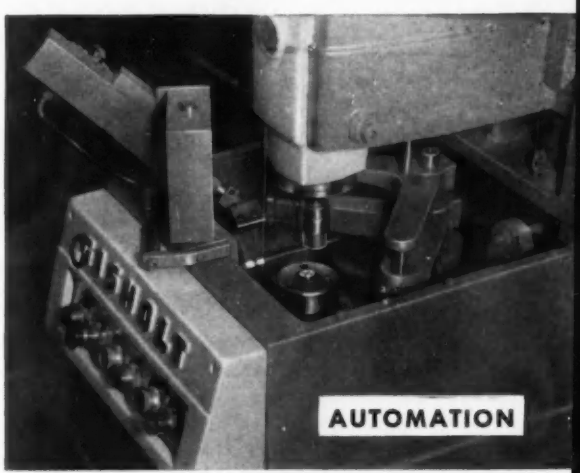
No. 4 Superfinisher Attachment

AXLE JOURNALS for railroad switchers are Superfinished with No. 4 Attachment on Gisholt Saddle Type Turret Lathe in this operation. In three steps, lathe finish of 200-250 micro-inches RMS is reduced to final surface finish of 8-10 RMS, removing .004" to .005" stock to eliminate tool marks. Through Superfinishing, 25 switchers logged 30,000 trouble-free hours on journals in first few months.

Superfinished tappet with .005-inch crowned top.

No. 81 High Production Superfinisher

CAST IRON VALVE TAPPETS are Superfinished in long runs on this job, featuring fully automatic handling with a work transfer device. Cup-shaped stones are used, Superfinishing from flat ground surface down to 5 micro-inches RMS or less—and rotating off center to generate .005" crown on the cam end of each tappet. In only 16 seconds floor-to-floor time per piece, the valve tappets are economically Superfinished for longer wear life and better product quality.



NEW GISHOLT MASTERLINE SUPERFINISHERS

ing flats, and amorphous "smear" metal left by grinding are completely removed. The true base metal is exposed—providing longer wear and better performance from your product.

Better still, most Superfinishing jobs are done in a fast, automatic cycle—producing very low micro-inch surface readings in the shortest possible time.

The jobs shown here are typical examples where Superfinishing solved production problems and improved product quality. Ask your Gisholt Representative to tell you about them—and many more—in full detail. Call him today!

WRITE TODAY for 30-page illustrated booklet "Superfinishers," explaining Gisholt Superfinishing process in interesting detail.

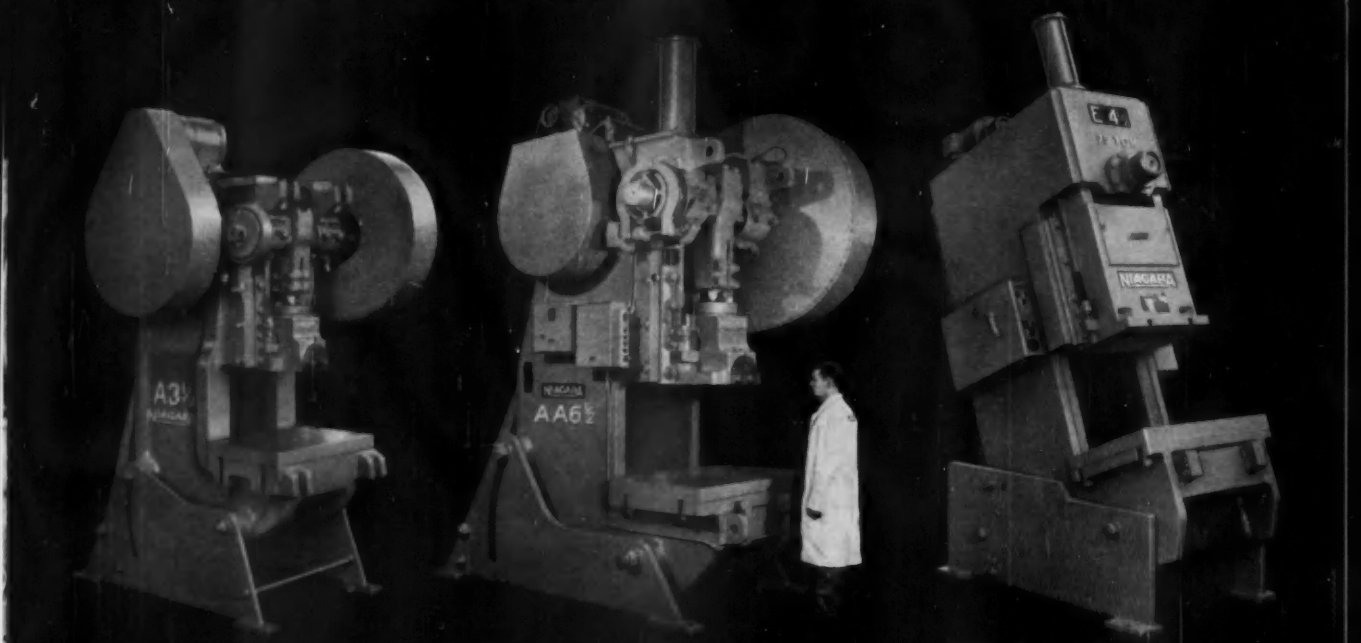
MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

NIAGARA HAS THEM!



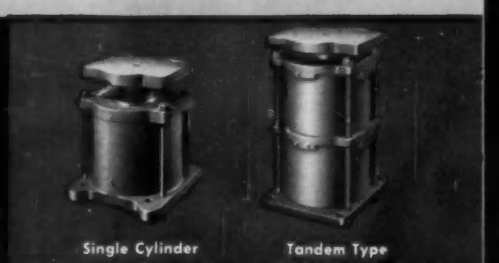
SERIES A, 5½-110 tons

SERIES AA, 32-200 tons

SERIES E, 75-200 tons
Front-to-Back Crankshaft

READILY EQUIPPED TO HANDLE

14 pt. Mechanical Sleeve | 18 pt. Electro-Pneumatic Sleeve | Electro-Pneumatic Friction



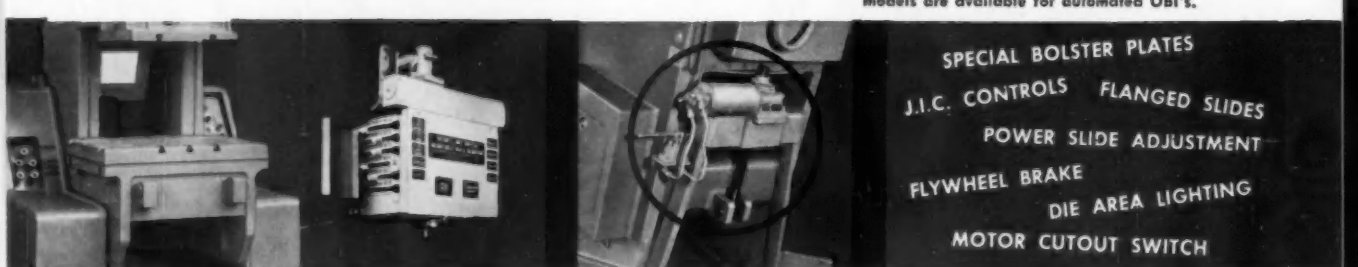
Single Cylinder | Tandem Type

THREE TYPES OF CLUTCHES

Each Niagara Inclinable features the clutch best suited for the purpose. (1) Famed Niagara multi-jaw mechanical sleeve clutch. (2) Exclusive Niagara multi-jaw Electro-Pneumatic sleeve clutch. (3) Niagara low inertia Electro-Pneumatic friction clutch.

FOUR TYPES OF DIE CUSHIONS

Designed and manufactured by Niagara, single cylinder and tandem type pneumatic die cushions are built in 4 types to make any Niagara Inclinable a double action press. Self-lubricating models are available for automated OBI's.



EQUIPPED FOR AUTOMATION

Featuring the most advanced controls and devices, Series EA (automated models) are engineered for peak productive capacity. Here's a line of OBI's that is completely equipped by Niagara for operation in your automation lines.

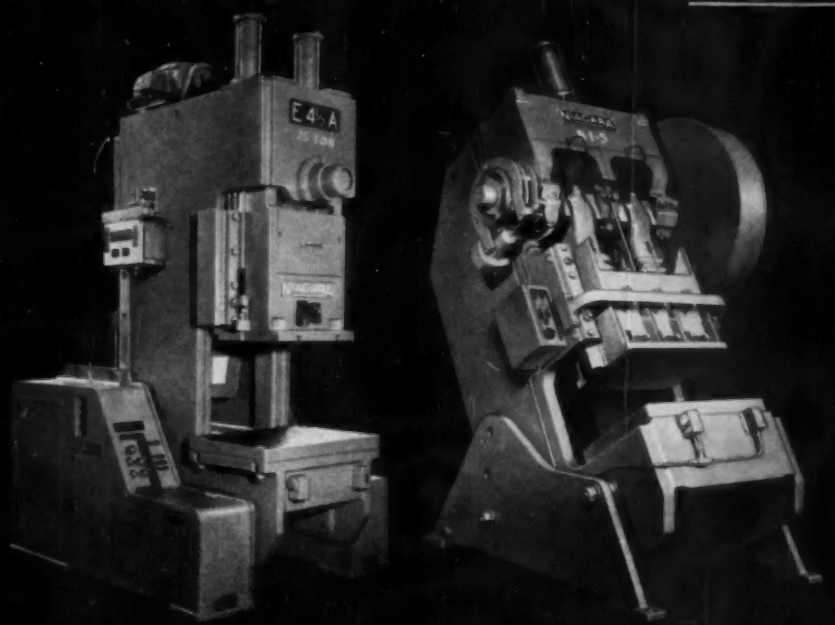
POWER INCLINING DEVICE

Fast-acting, safe and easy to operate, Niagara's air motor inclining device (shown above) is furnished as an optional accessory.

WIDE CHOICE OF ACCESSORIES

With a full selection of modern press accessories available, Niagara Standard Inclinables are adaptable to the widest possible range of job assignments.

standard OBI presses in all sizes and types that are right for you!



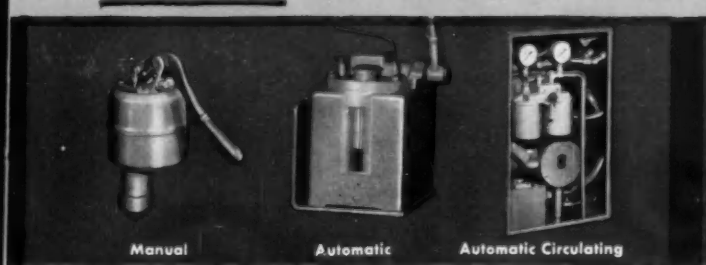
SERIES EA (Automated), 75-200 tons
Front-to-Back Crankshaft

SERIES BI, 60-200 tons
Double Crank

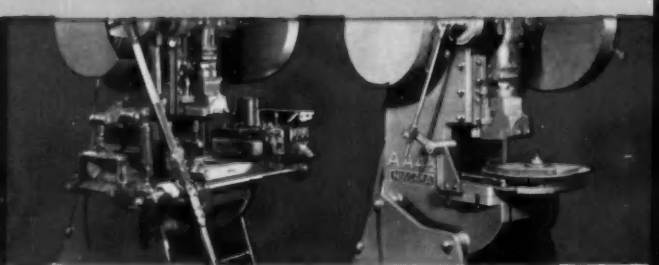
5 LINES . . . 34 MODELS
EACH A CHAMPION IN ITS CLASS

Niagara offers you industry's most complete, most modern, and most *exclusive* selection of standard inclinables . . . *plus* an unequaled choice of press accessories and automatic devices to meet your specific job requirements. You can count on Niagara for inclinables that will do the most to speed production, assure accuracy, prolong die life and hold down maintenance costs within your plant.

YOUR WORK MOST PROFITABLY



Manual Automatic Automatic Circulating



CENTRALIZED LUBRICATION TO FIT THE NEED

Niagara Inclinables are readily equipped with either manually-operated or automatic lubricators, or automatic circulating oil systems. It's one of the many ways in which Niagara outfits standard inclinables to meet individualized requirements.

ALL TYPES OF AUTOMATIC FEEDS

To speed production, Niagara Inclinables are easily equipped with complete, automatic feed arrangements: single roll, double roll, dial, chute, magazine and specially engineered types. Variable speed drives can be provided to allow adjustment for the optimum speed consistent with the die, material and feed length.

NIAGARA

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

GET ALL OF THE FACTS on any or all Niagara Inclinable Presses. Consult with a Niagara representative. His recommendation will be impartial. He has all types of OBI's to offer. At your request, specific Bulletins on each series, containing complete information and specifications, will be mailed to you promptly

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES:
Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia
Distributors in principal U. S. cities and major foreign countries

productive capacity. Here's a line of OBI's that is completely equipped by Niagara for operation in your automation lines.

ing device (shown above) is furnished as an optional accessory.

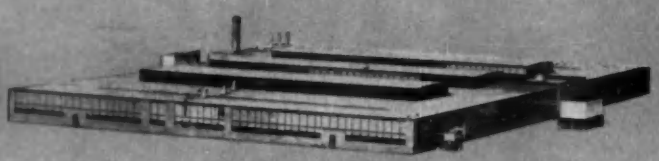
Inclinables are adaptable to the widest possible range of job assignments.

NOW! industrial hydraulic equipment from

WOOSTER DIVISION

PESCO B-W BORG-WARNER TRADEMARK

WOOSTER



Wooster Division now occupies this modern 104,000-sq. ft. plant in the heart of the mushrooming automotive and agricultural equipment industries. It is completely equipped for engineering, development, production and servicing of Wooster products.

Growth has led to the establishment of the Industrial Division of Pesco Products as a separate Borg-Warner facility—the Wooster Division.

This division will specialize in hydraulic pumps, motors, power packages and other accessories for *industry*—automotive, earthmoving, agricultural, material handling.

Here's how this will benefit users of industrial hydraulic equipment:

- **high product quality**—long associated with Pesco—will be assured from Wooster. Pesco "know how" plus a complete staff of experienced engineering, sales and production personnel has been installed at Wooster.
- **improved deliveries** from increased manufacturing facilities devoted exclusively to *industrial hydraulic equipment*.
- **better service** through close personal attention to customer requirements will be a Wooster operating policy.
- **advanced designs**—the result of extensive research facilities and development programs—will be a Wooster forte, in the Pesco tradition.

For detailed information or engineering assistance in applying Wooster hydraulic equipment to your products, contact the sales office nearest you or the main office.

WOOSTER PRODUCTS:

Hydraulic pumps • Hydraulic motors • Hydraulic power packages • Relief and control valves

WOOSTER SALES OFFICES:

CHICAGO — HArrison 7-5686
CLEVELAND — MOntrose 2-2100
DETROIT — UNiversity 2-4712
LOS ANGELES — STate 9-0487
MOLINE — 4-4235
SEATTLE — MAin 8442

EXPORT SALES:

Borg-Warner International Corp.
36 South Wabash Avenue
Chicago 3, Illinois

WOOSTER DIVISION • BORG-WARNER CORPORATION
Old Mansfield Road • Wooster, Ohio

BORG-WARNER

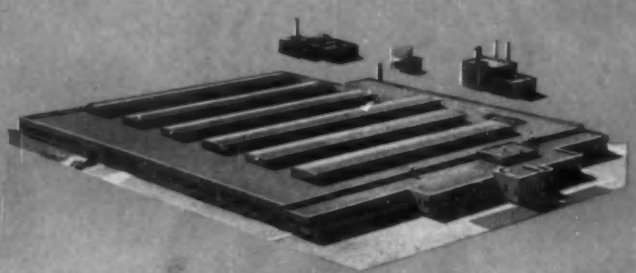
information and specifications, will be mailed to you promptly

Distributors in principal U. S. cities and major foreign countries

aircraft accessories from

PESCO PRODUCTS DIVISION

engineering Pesco® production



Pesco plant, "home of the aircraft fuel pump", is strategically located in a Cleveland suburb. Its 312,631-sq. ft. contain outstanding facilities for development engineering and aircraft-precision production.

Pesco—with an outstanding record as a leading supplier to the aircraft industry—now takes a forward step to improve and expand services to its customers.

All Pesco facilities are now being concentrated on the engineering and production of hydraulic and fuel accessories for military craft, commercial airliners, rockets and guided missiles.

Thus, the aircraft industry can now look with confidence to Pesco for—

- **better deliveries**—the result of increased manufacturing capacity.
- **accelerated engineering development** of new concepts of pressurized fluid flow for tomorrow's aircraft.
- **dependable products** designed for superior performance and utmost reliability.
- **a continual expansion** of facilities and services to keep pace with the aircraft industry which it serves.

You will agree, we think, that now—more than ever before—*Pesco means progress in pumps.*

PESCO PRODUCTS:

Fuel pumps • Fuel booster pumps
Hydraulic pumps • Hydraulic motors
Hydraulic power packages • Air pumps
Axial flow fans • Special electric motors

PESCO SALES OFFICES:

E. HARTFORD — BUtler 9-9327
LOS ANGELES — STate 9-0487
SEATTLE — MAin 8442
WICHITA — MUrray 6-6609

EXPORT SALES:

Borg-Warner International Corp.
36 South Wabash Avenue
Chicago 3, Illinois

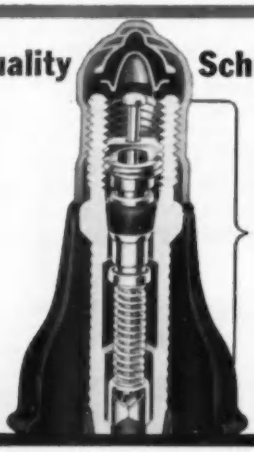
PESCO PRODUCTS DIVISION • BORG-WARNER CORPORATION

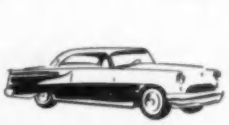
24700 North Miles Blvd. • Bedford, Ohio

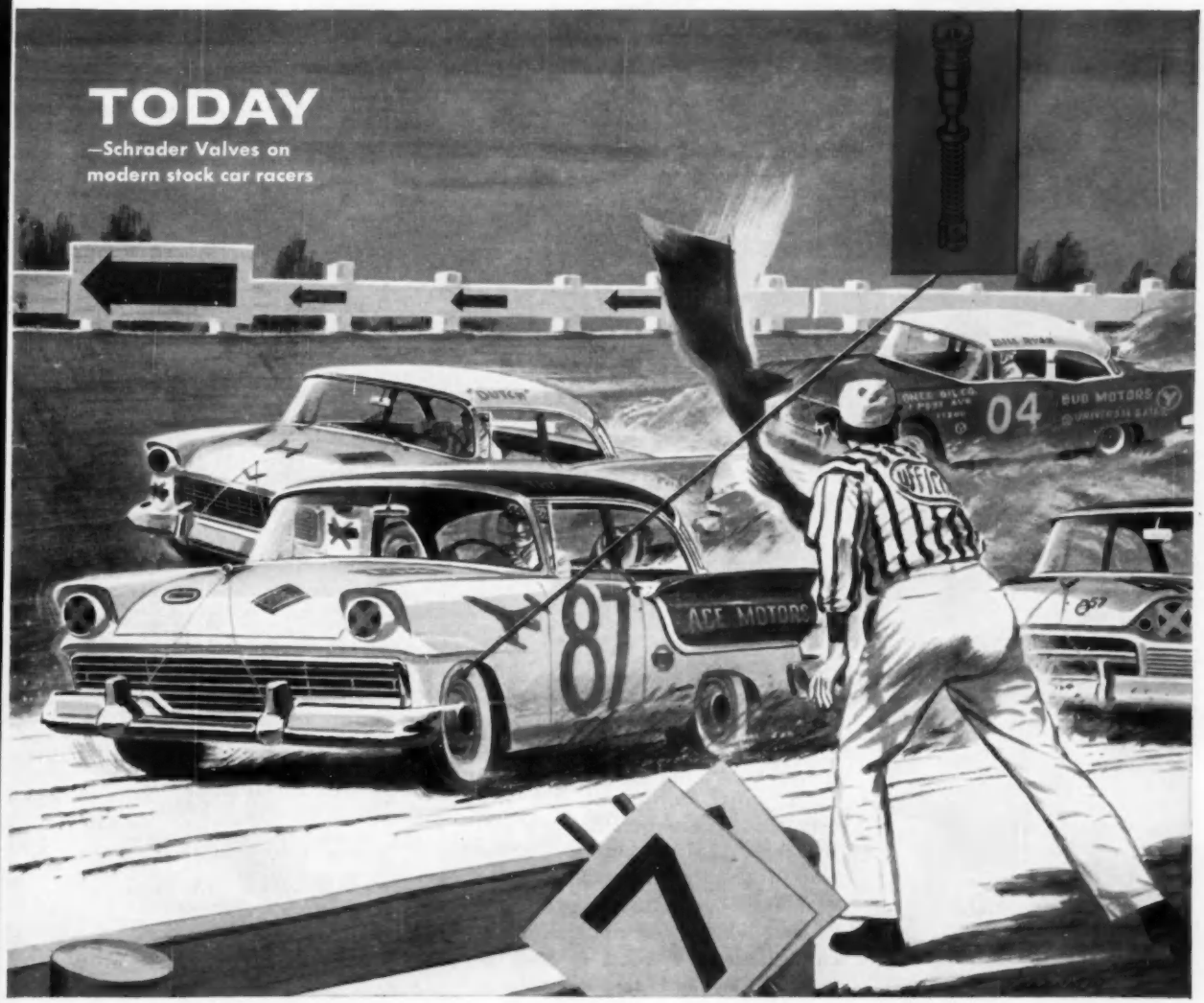
CORPORATION

OUTSTANDING TIRE

Quality **Schrader Valves for every pneumatic-equipped vehicle**







VALVE PERFORMANCE:

how cooperation pays off

The combined experience of the Automotive, Tire and Tire Valve Industries has made possible extremely high standards of performance. Schrader puts all this experience together to design and produce the most dependable tire valves for every type of vehicle in use today or planned for the future. You can count on quality Schrader Tire Valves to match the performance of your vehicles.

Schrader®
a division of SCOVILL

A. SCHRADER'S SON BROOKLYN 38, N. Y.
Division of Scovill Manufacturing Co., Inc.

FIRST NAME IN TIRE VALVES
FOR ORIGINAL EQUIPMENT AND REPLACEMENT

if your firm—
uses parts anything
—like these . . .

we'll show you
how to—

reduce your costs!

Through Albion's modern *resin shell* casting techniques, pearlitic and ferritic malleable irons may be cast to your specifications and tolerances with physical properties to suit your specific range of applications.

And more important, Albion's *resin shell molded* pearlitic and ferritic malleable iron castings combine the advantages of both castings and forgings. They're produced to extremely close dimensions to eliminate excess metal as well as machining or grinding operations; for greater production time, tool and labor savings.

Phone your Albion Malleable Iron Company representative today. He can show you how to save valuable time and dollars through Albion's modern casting techniques.

Albion's Research and Development Laboratory facilities are at your disposal. Whether you are designing new or reviewing present parts, Albion's engineers are anxious to assist you.

ALBION MALLEABLE IRON CO. ALBION MICHIGAN

CALENDAR
OF COMING SHOWS AND MEETINGS

ASME Oil and Gas Power Conference, Kentucky Hotel, Louisville, Ky. .....May 19-23

Design Engineering Conference and Show, Coliseum, New York, N. Y. .....May 20-22

American Petroleum Institute, Div. of Marketing, mid-year meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, N. J.....May 20-22

National Industrial Development Exposition, Coliseum, New York, N. Y. .....May 20-24

Fabricating Machinery Hydraulic Conference, sponsored by Vickers, Inc., Sheraton Cadillac Hotel, Detroit, Mich.....May 21-22

American Society for Quality Control, convention and exposition, Masonic Temple, Detroit, Mich. May 22-24

American Institute of Chemists, Inc., Sheraton-Mayflower Hotel, Akron, O. .....May 22-24

National Automotive Service Show, Boston, Mass. .....May 23-26

Paris Air Show, France...May 24-June 2

Paris International Trade Fair May 25-June 10

Indianapolis Race, Ind. .....May 30

First Annual National Aviation Trade Show, Monmouth County (N. J.) Airport .....June 1-9

American Gear Manufacturers Association, annual meeting, The Homestead, Hot Springs, Va. June 2-5

SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. .....June 2-7

American Society of Civil Engineers, national spring convention, Buffalo, N. Y. .....June 3-7

Technical Personnel Recruiting Exposition, Hotel Sherman, Chicago, Ill. .....June 8-12

National Industrial Advertisers Association, annual meeting, Waldorf-Astoria, New York, N. Y. June 9-12

ASME Semi-Annual Meeting, Sheraton-Palace Hotel, San Francisco, Calif. .....June 9-13

Western Plant Maintenance & Engineering Conference and Show, Civic Auditorium, San Francisco, Calif. .....June 11-13

Metal Stamping Industry, national sales conference, Hotel Carter, Cleveland, O. .....June 14

ASME Applied Mechanics Conference, Univ. of Calif., Berkeley, Calif. .....June 14-16

International Congress of Combustion Engines, general meeting, Zurich, Switzerland .....June 15-25

American Society for Testing Materials, annual meeting, Atlantic City, N. J. .....June 16-21

Institute of the Aeronautical Sciences, national summer meeting, Biltmore Hotel, Los Angeles, Calif. .....June 17-20

American Society of Agricultural Engineers, annual meeting, Mich. State Univ., Mich....June 23-26

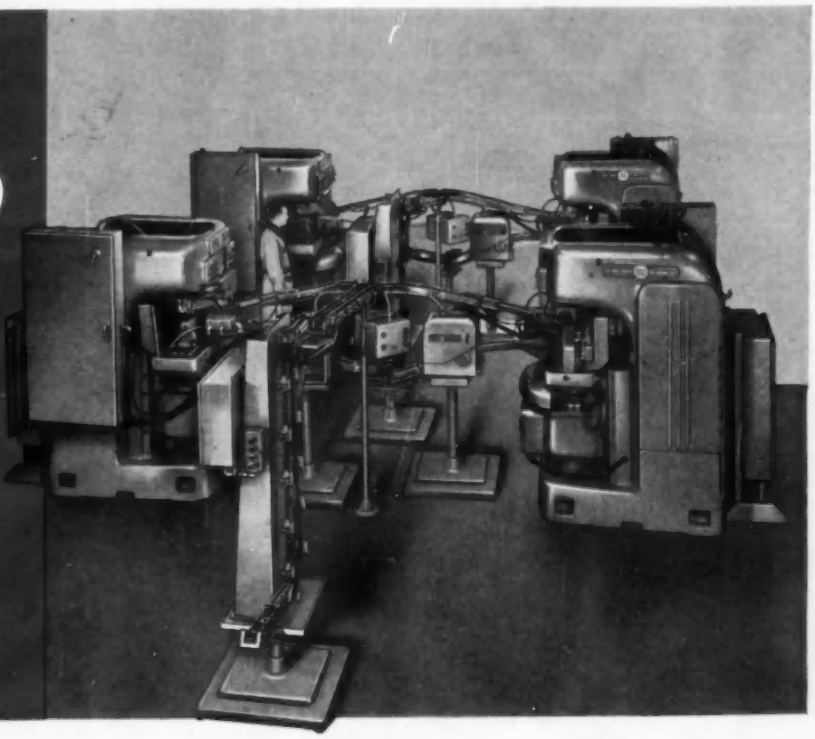
Chicagoland Fair, Navy Pier, Chicago, Ill. .....June 28-July 14

British Plastics Exposition, London, England .....July 10-20

National Machine Tool Builders' Association and American Tool Distributors' Association, annual sales conference, Cornell Univ., Ithaca, N. Y. ..July 20-Aug. 2

FULLY AUTOMATED GEAR SHAVING

CAN ALSO BE PERFECTLY FLEXIBLE



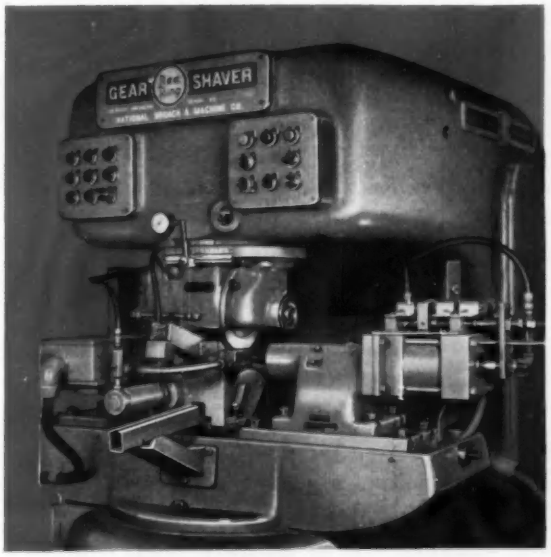
This fully automated installation shaves the split long pinion used in automatic transmissions. This pinion consists of two gear sections each of which is individually crown shaved. Output at full efficiency is 400 pinions (800 gear sections per hour).

The first pair of standard Red Ring Shaving machines processes one of the pinion sections. The second pair processes the other.

Automatic sizing gages perform a 100% check and reject any out-of-tolerance units.

Any individual shaving machine may be stopped at any time for cutter change or adjustment without interferring with the operation of the rest of the system. This is provided for by automatic switching in the feeder lines.

The flexibility of the supply and discharge lines greatly facilitate positioning the machines.



Write for further details.

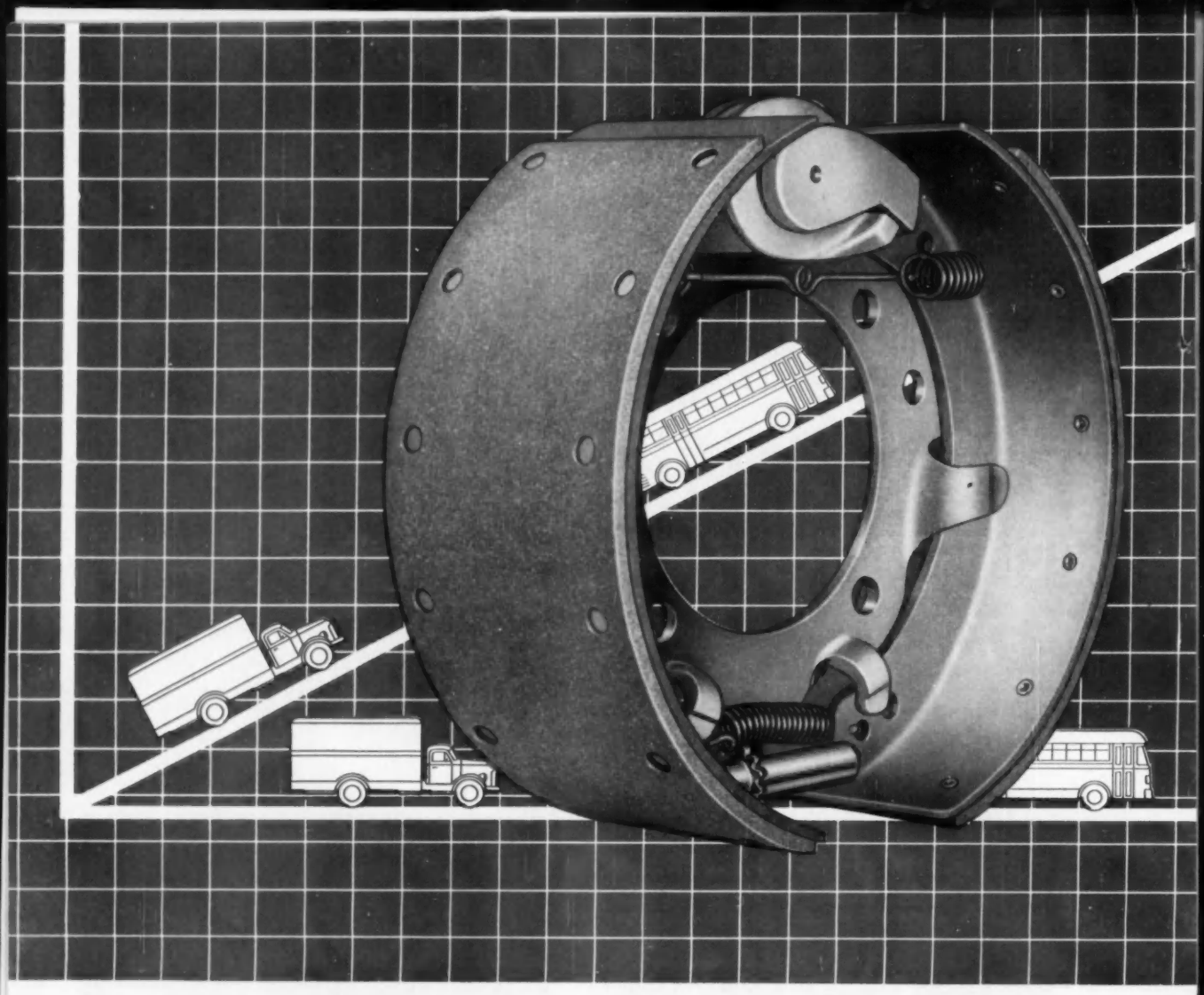
SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

7788

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



BENDIX DUO-DUTY AUXILIARY BRAKE

Power to hold on grades . . . Power to stop at road speeds

The Bendix* Duo-Duty auxiliary brake serves the double purpose of a positive parking brake and an emergency road-speed brake.

FOR PARKING, the Duo-Duty brake has ample torque capacity to keep the braked wheels from rolling on any hill or ramp, regardless of how steep.

FOR EMERGENCIES, it has the torque and thermal capacity to serve as a dependable stand-by brake at road speeds should the main braking system, for any reason, fail to work.

Minimum physical pull at the hand lever, less weight, fewer parts, mechanically simple.

A heavy-duty drive shaft brake that is rugged and right . . . built and backed by Bendix.

*REG. U.S. PAT. OFF.

BRAKES • POWER STEERING • POWER BRAKING • CONSTANT VELOCITY UNIVERSAL JOINTS • HYDRAULIC REMOTE CONTROLS

Bendix PRODUCTS DIVISION South Bend, IND.

Export Sales and Service: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

Bendix AVIATION CORPORATION

AUTOMOTIVE INDUSTRIES

BUSINESS DEPARTMENT

John C. Hildreth, Jr., Publisher
John F. Pfeffer, Asst. to Publisher
E. H. Miller, Advertising Mgr.
E. W. Hevner, Circulation Mgr.

REGIONAL MANAGERS

CHICAGO—William H. Baldwin
—Carl A. Zehner
360 North Michigan Ave.
Chicago 1, Ill.
Phone RAndolph 6-2166

DETROIT—Melvin B. Nylund
1015 Stephenson Bldg.
Detroit 2, Mich.
Phone TRinity 5-2090

PHILADELPHIA and NEW YORK—
Nelson W. Sieber
Chestnut and 56th Sts.
Philadelphia 39, Pa.
Phone SHerwood 8-2000
and
100 East 42nd St.
New York 17, N. Y.
Phone OXford 7-3400

CLEVELAND—Richard P. Keine
930 B. F. Keith Bldg.
Cleveland 15, Ohio
Phone SUperior 1-2860

TULSA—William J. Smyth
—John Sangston
621 Petroleum Bldg.
Tulsa, Okla.
Phone LUther 4-1769

SAN FRANCISCO—Frank W. McKenzie
1355 Market St.
San Francisco 3, Calif.
Phone UNderhill 1-9737

LOS ANGELES—L. H. Jackson
198 S. Alvarado St.
Los Angeles 57, Calif.
Phone DUnkirk 7-4337

●

One of the Publications
Owned by
CHILTON CO.
Executive Offices
Chestnut & 56th Sts.
Philadelphia 39, Pa., U.S.A.

Officers and Directors

JOSEPH S. HILDRETH, *Chairman of the Board*
G. C. BUZBY, *President*
Vice Presidents
P. M. FAHRENDORF
HARRY V. DUFFY
Treasurer—WILLIAM H. VALLAR
Secretary—JOHN BLAIR MOFFETT
GEORGE T. HOOK
MAURICE E. COX
FRANK P. TIGHE
L. V. ROWLANDS
ROBERT E. McKENNA
IRVING E. HAND
EVERIT B. TERHUNE, JR.
JOHN C. HILDRETH, JR.
RUSSELL W. CASE, JR.

High Spots of This Issue

★ **Important Design Changes in Modern Cars**

What has been the impact of some of the special developments introduced in 1957 and how will they affect future design? The author pinpoints in this discussion some of today's trends and speculates on their influence in the years ahead. Page 48.

★ **Making Propeller Shaft Assemblies at Saginaw**

The first part of this article treated the layout of the plant and machine lines at Plant 4 of Saginaw Steering Gear Div. This portion deals with the conveyor system; machining of universal joint spider; and various assembly work. Page 50.

★ **New Cars and Engines Pep Up Indianapolis 500**

Racing enthusiasts throughout the world will rivet attention on Indianapolis May 30 for the annual speed classic. Presented here are good tips on what to expect with smaller, lighter chassis and lower displacement engines. Page 54.

★ **Machine Tool Electrification Forum**

Sponsored by Westinghouse Electric Corp., this annual conference for an exchange of ideas on electrical equipment for machine tools was held in Buffalo, N. Y., last month. Reviewed here are principal highlights of the meeting. See Page 62.

★ **Preview of the Design Engineering Show**

Close to 20,000 visitors are expected to attend the second Design Engineering Show in New York's Coliseum May 20-23. It will occupy about 90,000 sq ft of floor space with some 375 of the nation's manufacturers displaying vital components. Page 70.

★ **58 New Product Items**
And Other High Spots, Such As:

Changes coming in '58 cars; Fawick-Girling brake system; lead and zinc meetings; Ford's new proving ground; Amsterdam Show; Vickers turbojet engine hydraulic symposium; volatility of gasoline; and industry statistics.

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

Six ways
Ryerson can serve you

Chances are that when you think of steel from stock, Ryerson springs first to mind. And for good reason. Every kind of steel, every shape and size, is immediately available from our tremendous reservoir.

But perhaps you don't always remember that Ryerson offers you much more—many other important products and services such as aluminum, plastics and fabricated construction steel. The pictures below illustrate the extent of our service. For a complete listing see the familiar red Ryerson catalog. Then as your needs arise—or whenever you have a question of selection, fabrication or application—look to Ryerson as your most complete and dependable source of help.

STEEL FROM STOCK

Carbon steels, alloys, stainless—bars, structurals, plates, sheet and strip, tubing—you can get quick shipment of one piece or truckloads from the world's largest steel stocks, at Ryerson. Get the steel with the certified seal—of quality.

ALUMINUM FROM STOCK

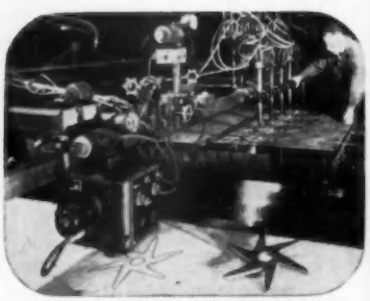
In areas served by our Chicago, Milwaukee, New York, Boston and Connecticut plants, draw on Ryerson stocks for aluminum too—sheets, coils, bars, plates—practically any aluminum requirement in stock sizes or cut to your order.

PLASTICS FROM STOCK

The convenience and dependability of Ryerson service is also available to buyers of industrial plastics—PVC pipe, valves and fittings, sheets and rods, rigid Kralastic pipe, flexible polyethylene pipe and tubing, etc.

FABRICATED CONSTRUCTION STEEL

Re-bars, spirals, etc. for reinforced concrete construction are fabricated at Ryerson plants from coast to coast. Also, at Chicago, Ryerson fabricates structural steel for the framework of buildings, bridges, etc.



FLAME CUT STEEL SHAPES

Your nearby Ryerson plant can quickly flame cut almost any shape from carbon, alloy or stainless steel—producing a single piece or thousands accurate to size and ready for your application. We take the work load—you save money.

MACHINERY AND TOOLS

The broadest line of metal-working equipment available from a single source is offered by the Ryerson Machinery and Tool Division. You can choose from thousands of types and sizes produced by nearly one hundred manufacturers.

RYERSON STEEL

In stock: Carbon, alloy and stainless steel—bars, structurals, plates, sheets, tubing, industrial plastics, machinery & tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 116, No. 10 **May 15, 1957**

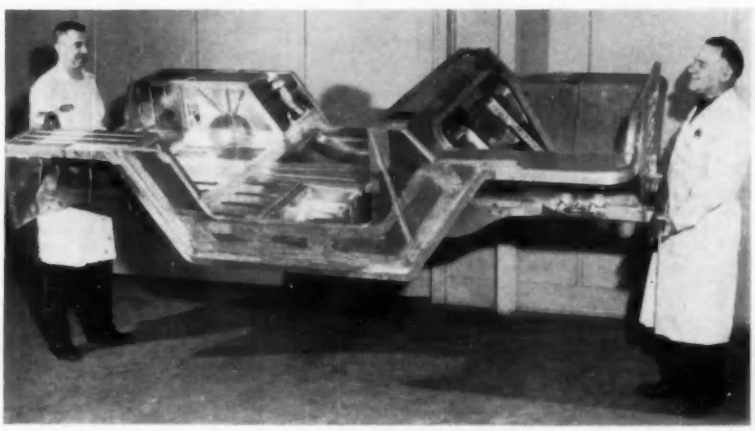
First Plymouths Shipped From Former Tank Plant

Automobile assembly operations got underway last month at Chrysler Corp.'s Newark, Del., plant. The first shipment of Plymouths left the plant on April 30.

At the outset, production at the plant will be limited to eight cars per hour until production equipment is thoroughly tested and supervisory personnel trained. Eventually, output will be hiked to a maximum of 25 per hour for the 1957 model run. Peak capacity probably will not be reached until the 1958 model program gets rolling.

Converted from a tank plant to automobile assembly over the past year, the plant will add more than 1.5 million sq ft of space to the corporation's present assembly operations. Some 600,000 sq ft of floor space has been added to the original facilities.

The plant currently employs 850 persons. This figure will be increased to a maximum of 1250 later in the year.



FORD BUILDS ALUMINUM MILITARY VEHICLE BODY

This all-aluminum unitized military vehicle body was designed and built by Ford Motor Co., in cooperation with Army Ordnance and Kaiser Aluminum, for a new XM-151-E2 experimental military vehicle. The aluminum integral body and frame structure, which is spot welded throughout, weighs only 124 lb. Wheelbase is 85 in., and overall length is 132 in. Powered by a four-cylinder, ohv engine, the vehicle has ball joint suspension and parallelogram steering linkage. Suspended brake and clutch pedals are used.

Chrysler Earnings Soar to Peak In First Quarter; GM Does Well

Record first-quarter sales piled up by Chrysler Corp. and Ford (see AI, May 1, p. 33) dramatically underscore the surge in car sales the two companies have been enjoying. Of the Big Three, Chrysler was the only one to rack up all-time high earnings, which more than quadrupled to $46.5 million from $10.9 million in the like 1956 quarter.

Chrysler's sales soared to a peak $1.15 billion, 55 per cent ahead of the January-March quarter last year. A profit margin of 4 per cent, compared with 1.4 per cent last year, was indicated. Shipments of cars and trucks rose by 38 per cent to 420,880 units from 305,661 during the same period in 1956.

General Motors did remarkably well in sales and earnings during the first quarter, despite a nine per cent drop in unit sales of cars and trucks, which totaled 944,078. Total GM sales in the quarter amounted to $3.07 billion. They topped by a shade last year's $3.06 billion, and nearly equaled the 1955 first quarter record of $3.1 billion. Earnings totaled $261.3 million, against $282.5 million last year, to reflect the drop in unit sales.

GM's gain in sales is attributed partially to higher prices on cars, a slight rise in defense business and a phenomenal increase in sales of optional equipment on cars. Popularity of higher-priced options partially explain the fact that the percentage gain in dollar sales by all the Big Three companies is higher than the percentage gain in actual unit deliveries.

The first-quarter report shows GM's defense sales amounted to $143 million, about $11 million more than during the same period last year. Chrysler's defense work, on the other hand, declined to $30 million from $60 million in 1956. It accounted for about three per cent of total sales.

Ford Picks Two More Plants For Assembly Of Edsel Line

Two additional plants have been selected for the assembly of Ford's new car, the Edsel. They are the new Mercury Div. plant near Los Angeles, now under construction, and the Ford Div. facility at Kansas City. The two plants bring to seven the number of units which will assemble the Edsel.

NEWS AUTOMOTIVE AND AVIATION

TRAILMOBILE UNIT DEVELOPMENT AIDED BY KAISER

Heading for the road is one of 50 new all-aluminum flatbed trailers built by Trailmobile for Pacific Intermountain Express. The units incorporate the latest technological advances in metallurgy and basic trailer design developed by Kaiser Aluminum & Chemical Corp. Additional design features were incorporated by Trailmobile. The 9460-lb trailers are equipped with interchangeable aluminum side panels and tarpaulins for quick conversion to van-type trailers. All of the trailers have an air-ride sliding tandem, which can be moved over a range of 10 ft to insure proper axle loading.

Chevrolet Expands Truck Line By Adding Several New Models

Chevrolet has added several new models to its truck line. They include three lower-priced tandems rated at 28,000 lb GVW and a new ½-ton cab-chassis long wheelbase model.

The tandems are offered in the 8000 series in wheelbases of 156½, 174½ and 192½ in. Rear axle on these models is of same design and capacity as larger 36,000 GVW units. Front axle has a 7000-lb capacity.

The cab-chassis unit has a 123-in. wheelbase and is designed chiefly for users needing extra frame length to mount larger, special bodies for light but bulky loads.

Chrysler Offers Workers Choice Of Shifting To Twinsburg Plant

Body stamping operations at some former Briggs plants in Detroit may be affected once production gets underway at Chrysler's new stamping plant in Twinsburg, O. Indication of this came in the announcement that Chrysler is offering employes of the Stamping Div. in Detroit the opportunity to transfer to the new Ohio plant.

A substantial part of the initial work force is expected to be drawn from Detroit plants. While it is conceivable that some of the old Briggs facilities may be affected by the move, operations at the corporation's large Nine Mile plant north of Detroit will continue uninterrupted.

Employment at the Twinsburg plant is expected to reach approximately 1000 persons by the end of the year. Peak employment eventually may reach 3500, the company said.

Stockholders' Suit Against S-P Is Dismissed By Federal Court

One of Studebaker-Packard's sharpest critics, Detroit attorney Sol A. Dann, has lost his fight to upset the management agreement between Curtiss-Wright and S-P. A Federal Court judge in Detroit dismissed the suit brought against S-P by Dann and two other stockholders on the ground that it did not contain a "short and plain" statement of claim showing the plaintiffs were entitled to relief. Nub of Dann's charges was that the company made "false and misleading" statements in soliciting proxies.

Ford Wins Big Order For Aircraft Engines

A $21.9 million contract for production of aircraft engines has been awarded to Ford Motor Co.'s Aircraft Engine Div. in Chicago. The latest contract brings the division's backlog of orders to $850 million. Deliveries under the contracts will be spread over the next two years.

Union Demands Fostering Inflation, Bugas Warns

Comments made last month (April) by John S. Bugas, Ford vice-president in charge of industrial relations, are a tip-off that the UAW may face stronger opposition in its demands next year than it ever encountered. In a speech at the Kellog Center at Michigan State College, Bugas warned that there is "serious evidence" that inflation is being fostered by excessive demands of labor unions. Capital formation, he said, is being discouraged by attempts of labor to seek wage and fringe benefits which the economy cannot safely absorb.

As expected, Mr. Bugas' comments drew immediate response from Walter Reuther. The latter already has indicated that the UAW next year will go all out "to get the most we can," including a shorter work week and higher wages. He blamed rising living costs on a "rigged inflation based on prices arbitrarily set by a handful of executives of major corporations."

Mr. Bugas predicted that collective bargaining would continue to be the basis for dealing with economic and other differences between management and labor. However, he warned, two things could come about to destroy it, such as: 1) one side might possess such dominant economic power that bargaining in form would be dictation in fact, and 2) one side might gain such great political power that collective bargaining would largely be supplanted by Government regulation.

He noted that wage and fringe benefits since 1954 have exceeded five per cent a year in key industries. Average hourly earnings in manufacturing, including cost of fringe benefits, increased 10 per cent from mid-1955 to the end of 1956. Output per man-hour, on the other hand, rose only two per cent a year for the economy as a whole in 1955-56. As a consequence, there was a cost pressure against prices.

ASME West Coast Meeting To Feature Varied Program

The forthcoming ASME Semi-Annual meeting will be held June 9 to 14 at the Sheraton-Palace Hotel, San Francisco, Calif. Among the many subjects to be covered will be jet-age aircraft, atomic power, safer industrial machines, new gas turbine engines, air pollution control, and improved mechanization.

More than 130 papers written by experts in fields ranging from aviation to wood industries will be presented and discussed. Those attending the meeting will tour several industrial installations in the area.

AMC Cuts Operating Loss To $5.3 Million In Fiscal Half

American Motors Corp. continues to reduce its losses. Operations were in the black during three of the last six months ended March 31, and the company wound up the first half of its fiscal year with a net loss of $5.33 million.

The loss was about $2.63 million under the $7.96 million loss the company incurred in the like period a year earlier. A non-recurring credit of $7.14 million, arising from the sale of AMC's holding in Ranco, Inc., however, reduced that actual net loss to $827,554.

Sales for the period amounted to $186.9 million, compared with $225.9 million in the similar period a year ago. Net working capital totaled $53.1 million, against $54.6 million six months earlier.

The change is accounted for almost entirely by setting up as a liability in the balance sheet the $1.2 million AMC must pay to dissenting Hudson stockholders. The figure was set recently by appraisers.

George Romney, AMC president, said that the company's rate of improvement in the final half year is expected to be even greater than in the first six months. For the year as a whole, operating losses should be less than half of what they were in 1956, Mr. Romney indicated.

Despite disappointing sales of the larger Nash and Hudson cars, AMC's total sales in the six-month period were only slightly under the year-ago period. They totaled 54,006 units, against 54,189 a year ago. Lower sales of the larger cars were offset by gains made by the Rambler. Sales of the smaller car totaled 36,786, about 22 per cent ahead of the 30,167 units sold a year earlier.

Pressed Metals Plant To Reopen Next Month

Talks between Pressed Metals of America, Inc., and Ferrocast Corp. of Santa Monica, Calif., are proving fruitful. No details have been given yet on a possible merger of the two firms. However, a step toward revitalizing Pressed Metals was taken last month with the announcement that the Port Huron, Mich., plant will be reopened in June.

Initially, the plant shut down since March 15 because of unfavorable earnings, will operate on a curtailed basis. Only about half of the plant will be used for production of automotive suspension parts. Equipment not needed in this operation will be auctioned off this month.

WOLSELEY HAS MANY COMPONENTS OF MORRIS MINOR

Small Wolseley made by the British Motor Corp. combines many chassis components of the Morris Minor with the basic 90.88 cu in. engine. The 50-hp power unit is coupled to a four-speed gearbox that provides an effective overdrive in the top ratio. The unitary body shell has front suspension by torsion bars. Interior is luxury-finished.

Ford Defense Contracts Total $969 Million In 18-Mos. Period

Ford Motor Co. received three times as much in defense contracts as did General Motors in the 18-month period ended last June. A Defense Dept. report shows Ford's contracts totaled $969 million, compared with GM's $326 million. Indicated is a continuous strong emphasis by the U. S. on aircraft development and production.

GM, however, continues to be the leading company in production of military equipment. It has received more than $7 billion in military orders since July, 1950.

Pint-Sized Metropolitan Making Big Sales Gains

The small car continues to make inroads in the U. S. market, although sales so far have not been too significant. American Motors reports that sales of the pint-sized Metropolitan during the first 10 days of April increased 113.2 per cent over the comparable period last year. Imports totaled 307 against 144 last year.

Rambler sales also have shown a pickup. They moved ahead by 14.5 per cent in the same April period.

Chicago Bids To Hold Title As Largest Automobile Show

The battle of the automobile shows is on. Not to be outdone by the New York National Show, revived by the Automobile Manufacturers Association, last year, the Chicago Dealers Association is considering expanding its extravaganza next year. Plans are to lease an additional 150,000 sq ft of space in the Amphitheater, which would bring total space to 450,000 sq ft.

The New York Show last year occupied about 300,000 sq ft. At present, there are no indications as to whether space will be expanded for the next show, for which no dates have been set yet.

Popularity Of White Cars Pointed Out By Chrysler

Evidence of how trends change constantly in automotive buying habits is a report from Chrysler Corp. on automobile color preferences. Last year, the corporation noted, black was the favorite color.

This year black has been pushed down to second place by white. The latter appears on 26 per cent of the cars sold by all Chrysler Corp. divisions, either as a single color or in combination with other hues.

Bendix-Scintilla Announces A Major Expansion Program

A $5 million plant expansion program, scheduled for completion in stages by 1961, has been announced by Scintilla Div. of Bendix Aviation Corp. It will add about 200,000 sq ft to the present 560,000 sq ft of plant space.

The first phase of construction under the program—an 11,000 sq ft facility—has been completed. Construction has begun on a 52,000 sq ft addition, designed for electrical connector manufacturing and related engineering and sales groups. The division will also build a new 15,000 sq ft plating-waste disposal plant to be completed by the end of next year.

NEWS AUTOMOTIVE AND AVIATION

TRAILER HANDLER

The Trailer Spotter, introduced by Four Wheel Drive Auto Co., can hook onto, move, and unhook from a semi-trailer without driver getting down from his cab. Cab has swivel seat, which swings around vertical steering column; steering wheel to guide front wheels and steering lever to direct rear wheels; and two sets of accelerator and air brake pedals.

Raybestos-Manhattan Facility To Test and Develop Adhesives

A new laboratory has been constructed by Raybestos-Manhattan, Inc., at its plant in Stratford, Conn. It is intended for the development and testing of the line of Ray-BOND adhesives, coatings and sealers made by the Adhesives Dept.

Equipment includes tensile machines for shear and peel tests, ovens for testing up to 600 degrees, pilot mixers, salt spray testing cabinets, and humidity testing area. The latter permits testing the drying time and other properties of adhesives under a great variety of climatic combinations.

Ford Sets Up Training Program For Production Line Employes

Ford Motor Co. last month became the first company in industry to take steps toward preparing production line workers for the age of automation. Under an agreement between the company and the UAW, older seniority workers now will be able to receive apprenticeship training so they may qualify as *bona fide* skilled tradesmen. Until now, only employes between the ages of 18 and 26 were eligible.

The move undoubtedly will set a pattern in industry, which has been plagued by a shortage of trained personnel. Its effects are likely to become even more significant as automation continues to bring upgrading in job skills.

Under the agreement, production line workers will have the opportunity to take classroom instructions at company expense. Only requirements are that they receive the necessary apprenticeship shop hour credits and be able to pass physical and mental aptitude tests.

There is one restriction, however, only one older seniority worker will be taken into the program for every two accepted in the 18-26 age bracket.

Allis-Chalmers Sales, Earnings Dip Slightly

First quarter sales of $138 million, slightly below last year's $140 million record, are reported by Allis-Chalmers Mfg. Co. The company attributed the lower sales to a slow start in the construction machinery and farm equipment business.

Earnings totaled $5.1 million, compared with $5.7 million in the like 1956 quarter. Unfilled orders at March 31 totaled $250 million, an increase of $76 million over a year ago. Backlog does not include commercial orders of the tractor group divisions.

Republic Steel, National Lead Set Up New Metallurgical Firm

Republic Steel Corp. and National Lead Co. have announced the formation of R-N Corp. The new organization, owned jointly by the two companies, has developed a direct reduction process for the treatment of both low-grade and high-grade iron ores.

It will provide the steel industry with high metallic iron feed materials for use in blast furnaces, electric, open hearth and cupola furnaces. Major steel companies have evidenced considerable interest in the process.

The high-grade products for open hearth, electric or cupola furnace feed are prepared in briquettes weighing from 5 to 25 lb. The blast furnace grade is produced as conventional "peach seed" briquettes. However, if desirable, larger briquettes may be produced.

The iron turned out by the new R-N process is predominantly for use in the metallurgical field, but may also be useful to the chemical and other industries. Supporting research and pilot plant development work by Republic Steel Corp. and National Lead Co. are continuing.

UAW Launches Campaign For Shorter Work Week

The UAW this month ignited the firecracker which it will officially toss into the lap of the automobile industry when negotiations on new contracts open a year hence. In a letter to the six car company presidents, UAW President Walter Reuther asked that the manufacturers join with him now to set up joint committees to study the union's drive for a shorter work week in 1958.

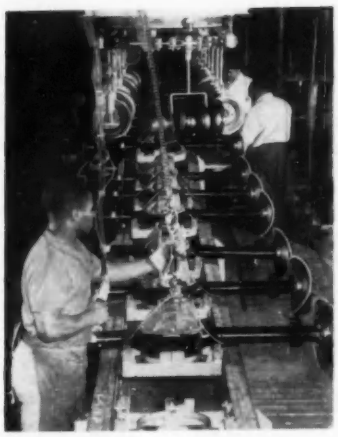
The joint study committee, as recommended by Reuther, would be composed of representatives of both management and labor. The group, Reuther says, would seek to establish facts, identify problems to be solved, and narrow the area of controversy to be settled over the bargaining table.

Ford Chassis Parts Facility Swings Into Full Operation

Chassis parts by the millions are now rolling from the new manufacturing plant of Ford Motor Co. in Sterling Township, Mich. Encompassing 1.8 million sq ft of floor space, the plant is located on a 150-acre site at Mound and Seventeen Mile Roads, 18 miles north of downtown Detroit.

Major products of the plant include complete rear axle (see illustration) and differential assemblies, drive shafts, and ball-joint front suspension assemblies. Parts are shipped to all of the company's Ford and Mercury assembly plants. Production will be added soon to supply components for the Edsel line which will be introduced later this year.

The Sterling plant is the headquarters of Ford's Chassis Parts Division. This division also operates the Can-



Two 320-ft final assembly lines turn out 700 rear axle units an hour. The plant also produces drive shaft and ball-joint front suspension assemblies for Ford passenger cars and trucks.

ton, O., forge plant which supplies forgings used at the Sterling plant.

Incoming raw materials—forgings, castings and bar and sheet steel—are received along the entire north side of the plant. About three million lb of raw materials are consumed daily.

The processing may follow intermittent winding courses, but the flow moves steadily from the north to the shipping docks on the opposite side. Automation equipment, conveyors, and fleets of industrial trucks move the parts through the production processes. If extended in a straight line, the vast overhead monorail conveyor network in the plant would stretch 11 miles.

After progressing through production operations, the finished and inspected assemblies are moved to depressed sidings extending the full length of the south walls. An average of 35 railroad freight cars and 30 highway trucks loaded with parts move out from the shipping docks daily headed for 20 company assembly plants in 14 states.

Eaton Mfg. Plans to Construct Laboratory for Fredric Flader

Eaton Mfg. Co. has announced plans to build an engineering and research laboratory for its Fredric Flader Div. Costing more than $700,000, it will be erected on a 10-acre site at Tonawanda, N. Y.

It will replace a Government-owned laboratory leased by Fredric Flader in Toledo, O. The new laboratory will specialize in the field of components for turbojets and industrial gas turbines.

AI TABLOID

General Electric Co. expects its 1957 sales to exceed the 1956 record of $4,090,015,685 by about 15 per cent. The company will spend about $185 million for new laboratory and manufacturing facilities this year.

* * *

Glenn L. Martin Co. is shortening its name to The Martin Co.

* * *

H. K. Porter Co., Inc. has acquired Federal Wire & Cable Co., Ltd . . . U. S. Industries, Inc., is acquiring Kett Corp.

* * *

Chevrolet is building a waste treatment plant to purify waste water and salvage oils for reuse adjacent to its Alexis Rd. transmission plant in Toledo, O.

* * *

Allis-Chalmers Mfg. Co. has established a new subsidiary in Australia — Allis-Chalmers Australia Pty., Ltd.—and through it has purchased the assets of Thomas C. Pollard Pty., Ltd., Newcastle.

* * *

Lincoln Div. of Ford Motor Co. will introduce a new Mark III version of the Continental car next fall.

* * *

Dole Valve Co. has moved to 6201 Oakton St., Morton Grove, Ill. . . . Sterling Die Div. of Pratt & Whitney Co., Inc., is moving to a new plant in the Southwest Industrial Park section of Cleveland, O.

* * *

Reynolds Metals Co. expects 1957 sales and earnings to surpass the $41.2 million reported in 1956.

* * *

Diesel Energy Corp. has established a special Deutz Diesel Marine Engine Dept. to promote the sale of Deutz marine engines. A network of dealers will be appointed soon.

* * *

Army will construct a $2.5 million anti-aircraft guided missile control center in Monmouth County, N. J.

* * *

Seaboard Coil Spring Div. of Associated Spring Corp. is changing its name to Seaboard Pacific Div. . . . City Auto Stamping Co. will change its name to Globe-Wernicke Industries, Inc.

International Harvester Co. has made available LPG fuel systems for three of its heavy-duty, truck-type V-8 engines.

* * *

Outboard Marine Corp. is undertaking a $20 million expansion program.

* * *

A $1.525 million Cleveland Engineering and Scientific Center will be built on Chester Ave. near E. 30th St. . . . Robert Bosch Corp. will construct a headquarters building in Long Island City, N. Y.

* * *

Jones & Laughlin Steel Corp. expects to operate at an average of 95 per cent of capacity through 1957 and earn $50 million.

* * *

Kaiser Aluminum & Chemical Corp. has under study at its Metal Research Laboratories a radiator based on the usage of zinc-clad aluminum sheet.

* * *

Steel industry has begun celebration of the 100th anniversary of the mass production of steel in the U. S. with the opening of a Steel Centennial exhibit in the main rotunda of Pennsylvania Station, New York City.

* * *

Westinghouse Research Laboratories are using atomic radiations to detect and control the level of molten titanium in a new "cold hearth" arc furnace designed to prepare the purified titanium metal.

* * *

Air Force has developed a giant solar furnace to produce temperatures up to 8000 F for testing missile metals.

* * *

Vapo-Therm Systems, Inc., is name of new firm located at 18101 James Couzens Highway, Detroit 35, Mich., to design and fabricate specialized processing equipment.

* * *

Canadair, Ltd., has re-entered the commercial aircraft field.

* * *

Navy has accepted a General Electric rocket engine for the first stage of the earth satellite project and an Aerojet-General liquid-fueled rocket for the second stage of the three-stage unit.

(*Turn to page* 138, *please*)

News AUTOMOTIVE AND AVIATION

BEAUTIFIED DODGE PICK-UP TRUCK HAS HIGH STYLE

This new stylized Dodge truck with swept-wing design, two-tone color, and chrome trim has been named the "Sweptside 100." Powered by either a 204-hp V-8 or 120-hp, six-cylinder engine, it is built for rugged duty with a 1675-lb payload capacity.

East Germany to Build Egyptian Vehicle Plant

East Germany is to build for Egypt a vehicle assembly plant nominally valued at the equivalent of $75 million. Located near Cairo and planned for completion in 1959, the factory will produce several military-type models.

These include a staff car version of the small Wartburg sedan, a three-ton troop carrier, a cross-country truck, and a heavy transporter. Local manufacture of some components is foreseen. Several Czechoslovak factories will take part in the project as subcontractors.

It is understood that bids for this project were also made by Volkswagen and Mercedes. However, they reportedly were unable to match the low East German quotation.

GM Shareholders To Vote On Stock Option Program

General Motors, which has had a bonus program for certain key employes since 1918 and a stock purchase program for several years, plans to do even better by its top-echelon executives. Stockholders this month (May 24) will be asked to approve a proposal to add a stock option plan for some 250 corporation executives.

Under the plan, an eligible executive would receive a cash bonus equal to 75 per cent of the amount he normally would receive, and an option to purchase stock for the amount equal to his reduced cash bonus. Unlike Ford's stock option plan, which permitted key executives to buy stock at a reduced price, the GM plan will entitle those selected to buy shares at the "fair market value" at the time he gets his bonus.

A contingent credit of GM stock, however, would be set up for each executive equal to one-third of his option. This credit thus would equal the 25 per cent by which his normal bonus was reduced. Under the plan, options would be granted over the next five years and be exercisable over the next 10 years.

Ford's stock option plan last year enabled officers and directors to offset sharp reductions in salaries and bonuses. These were cut as a result of lower company earnings.

The officials drew about $2 million less in salaries and bonuses in 1956 than during the previous year. However, the 434,250 shares they purchased at a reduced price of $21 a share had an approximate market value of nearly $24 million, figured at an "in-between" market price of $55 at time of purchase.

Two New Directors Elected By Studebaker-Packard Corp.

Two new members have been elected to the Studebaker-Packard Corp. board of directors. They are J. Cheever Cowdin, a broker affiliated with Cady Roberts & Co., and William L. Hanaway, senior partner in the law firm of Breed, Abbott & Morgan.

Numerous New Developments Are Being Studied by S-W

Speaking before the recent National Industrial Research Conference in Chicago, Bennett Archambault, president of Stewart-Warner Corp., stated that S-W has about 35 major projects or project groupings under study. These are intended for product improvement or diversification, and include: new, centralized automatic lubricating systems for automotive and industrial applications; electric fuel pumps; industrial instrumentation; and air spring suspension devices.

Also: materials handling devices; heat exchange systems for jet engines; cooling systems for guided missiles; heat pumps; electronic data processing equipment; electrical facsimile systems; electronics devices for commercial airline use; and railroad electronics systems.

A new type of free piston engine is among longer-range projects. Mr. Archambault said. If development work is successful, the engine should have superior performance and operating capabilities.

R. E. Knight, vice-president and director of research and development for Kaiser Aluminum & Chemical Corp., told the group that the automobile industry had taken about 11 lb of aluminum per car in 1950, 35 lb per car last year, and 45 lb this year. Consumption is expected to increase greatly in the years ahead.

Kaiser Aluminum, jointly with Doehler-Jarvis Div. of National Lead Co., developed and built a die-casting machine able to die-cast the entire engine block for an eight-cylinder automobile engine. Mr. Archambault quoted Charles F. Kettering as saying that the all-aluminum engine is entirely feasible after some problems are worked out.

Two Factors to Push UAW Wage Up Seven Cents an Hour in June

More than one million UAW members are in line to receive what amounts to a double pay raise next month. In addition to a penny-an-hour increase under the cost-of-living formula, they will receive a six cents-an-hour wage boost under the annual 2½ per cent improvement factor, which is due simultaneously in June.

Living costs, the Government reported, rose two-tenths of one per cent in March to another all-time high. The Bureau of Labor Statistics index that month climbed to 118.9 per cent of the 1947-49 average level of prices. It was the seventh straight month of record costs.

Knudsen Clings to Forecast Of a 6.5-Million-Car Year

Although automobile sales through April failed to show a significant rise over the March level, some industry observers are still holding to the hope that the year's sales will top 1956 by about 10 per cent. Many automobile company executives now have conceded that retail sales probably will not exceed 6.3 million units.

An opposite view has come recently from S. E. Knudsen, Pontiac Div. general manager, who has revived the unaltered forecast made last December by GM President Harlow H. Curtice for sales of 6.5 million cars this year. Mr. Knudsen makes an interesting observation to support his optimistic outlook. He notes that while the anticipated boom has not materialized, it is unlikely that there will be a sudden downturn in sales that normally follows the boom either. Sales for the first four months of this year are estimated at around 1.92 million, a shade under the 1.98 million cars sold during the like period last year.

So far car makers have managed to key their production schedules in line with sales. While there were some cuts made in weekly production schedules, they have not been as drastic as those made at the same time last year, when the expected spring sales boom failed to show.

The country's bankers are among those skeptics who continue to cast doubt on a 6.5-million-car sales year. Challenging Knudsen's estimate is Arthur O. Dietz, chairman of C. I. T. Financial Corp., who says that retail car sales will approximate last year's 5.9 million units.

B-W Quarterly Earnings Decline to $8.9 Million

Borg-Warner Corp. sales for the three months ended March 31 totaled $164.5 million, slightly ahead of the $162.5 million in the like 1956 period. Earnings, on the other hand, declined to $8.9 million from $9.6 million last year. Despite the lower quarterly earnings, the company is confident sales and earnings for the year will exceed 1956.

Northrop International Set Up

Northrop Aircraft, Inc., has established a new division to be known as Northrop International. The new organization, which will have offices at 9756 Wilshire Blvd., Beverly Hills, Calif., will be charged with the responsibility for all overseas programs of Northrop Aircraft, Inc.

DUTCH BUS HAS EXCELLENT CORNERING ABILITY

Articulated bus built in Holland is 55 ft, 3 in. long and carries 150 passengers. To make tight cornering possible, the rearmost pair of wheels is steered by rods connected to the coupling turntable. The space between the two bodies is covered by a bellows canopy to exclude drafts and reduce wind resistance. Basic chassis is a British A.E.C. Regal IV with 165-hp Diesel engine.

Fruehauf and Coleman to Sell New Airfield Vacuum Cleaner

Coleman Engineering Company, Inc., has announced completion of a license agreement with the Fruehauf Trailer Co., to manufacture and sell the Fruehauf Cole-Vac airfield vacuum cleaner. It was indicated that initial manufacture would be done by Fruehauf in its West Coast plant.

The airfield vacuum cleaner was designed specifically by the Coleman Co. to clean runways for the protection of jet airplanes. Coleman will continue to handle design and engineering work on the unit, while Fruehauf will be the manufacturer handling sales and service on a national and international basis.

The 28-ft-long Fruehauf Cole-Vac is mounted on a standard commercial truck chassis and is powered by a regular truck engine. It can clean at a speed of 25 miles an hour. A separate engine powers the vacuum system.

Ford Quarterly Payroll Is Second Highest Ever

Ford Motor Co. hourly and salaried employes earned $308.8 million during the first quarter of 1957, the highest total for a comparable period. It was the second highest total on record for any quarter, surpassed only by earnings of $325.6 million in the last quarter of 1956.

During the first three months of 1957, an average of 143,383 Ford hourly employes worked an average of 42.5 hours a week and earned an average $108.53 a week. Average hourly employment was the highest for any quarter in company history, while average weekly earnings were the highest on record for a first quarter. U. S. Bureau of Labor Statistics' first-quarter figures placed national average weekly earnings for all manufacturing industries at $82.21.

Motor Wheel Sales, Net Decline In First Quarter

Earnings of Motor Wheel Corp. in the first quarter, ended March 31, amounted to $530,376 compared with $757,330 for the like period a year ago. Sales totaled $19,443,186, compared with $21,161,853 in the 1956 period.

Construction of Motor Wheel's plant at Newark, Del., is nearing completion. Production of wheels, hubs, and drums will get underway this summer.

Ford Fund Scholarships Awarded To 70 Students

Seventy high school seniors from 13 states have been awarded four-year scholarships by the Ford Motor Co. Fund. Winners were picked from 654 applicants who were scholastically in the upper one-third of their graduating classes, and who had met other requirements.

The scholarships, which go to sons and daughters of Ford employes, provide for the payment of tuition and fees and a major portion of living costs.

Budd Sales and Earnings For First Quarter Stated

The Budd Co. earned $2,668,416 on sales of $83,163,140 during the first quarter of 1957. These figures compare to earnings of $3,978,280 on sales of $83,976,526 for the first quarter of 1956.

MEN IN THE NEWS

Russell, Burdsall & Ward Bolt & Nut Co. —Robert M. Smith has been named assistant vice-president for sales.

Ford Motor Co.—**Andrew A. Kucher** has been elected a vice-president for engineering and research, and **Earle S. MacPherson** has been named vice-president and adviser for engineering policy, at the staff level.

Chevrolet Motor Div., General Motors Corp.—**R. S Plexico** is now chief truck design engineer; **H. O. Flynn,** assistant chief engineer in charge of truck chassis; **A. C. Mair,** staff engineer for frames, suspensions, steering, wheels and tires, tools and other related parts; and **P. E. Hitch,** staff engineer for axles, brakes, transmissions, clutches, drive lines, radiators and fans.

Black & Decker Mfg. Co., Ltd.—**Drummond R. Stuart** has been appointed general manager.

Chrysler Div., Chrysler Corp.—**Harry L. Ault** has been appointed advertising manager.

Cadillac Motor Car Div., General Motors Corp.—**Clarence E. Morphew** was made staff engineer in charge of production engineering activity.

Joseph T. Ryerson & Son, Inc.—**H. Daniel Robb** was promoted to manager, alloy steels, and **John Cattanach, Jr.,** was made manager of sales of tubular products and cold finished steel bars at the Buffalo plant.

Sahlin Engineering Co., Inc.—**Edward H. Rofe** has been appointed chief engineer.

Rochester Products Div., General Motors Corp.—Russell F. Sanders was named director of engineering and sales.

Thor Power Tool Co.—James A. Lind and John F. Corkery were named vice-president for finance and vice-president for public relations, respectively.

Martin Co., Baltimore Div.—**Howard W. Merrill** has been named a vice-president.

Kiekhaefer Corp.—**Thomas B. King** has been appointed public relations director.

Borg-Warner Corp.—**S. G. Gregory** has become director of personnel services.

Lipe-Rollway Corp. —Robert M. Zimmerman has been appointed general manager.

Buick - Oldsmobile - Pontiac Assembly Div., General Motors Corp.—**Henry T. Brian** was named production manager of the Kansas City, Kan., plant, and **John Holmes, Jr.,** director of personnel for the division.

American Chemical Paint Co., Metalworking Chemicals Div.—**Ellsworth A. Stockbower** was made manager of new product sales.

Mercury Div., Ford Motor Co. —**Richard M. Hanselman** was named manager of the Plant Engineering Dept.

E. W. Bliss Co.—**Willard F. Rockwell, Jr.,** and **Peter M. Flanigan** have been elected directors.

Ford Div., Ford Motor Co.—**Robert J. Copp** was made Philadelphia district sales manager, succeeding **Harrison Smith,** now Pittsburgh district sales manager.

Wagner Brothers, Inc. —Frank M. Mansfield was named sales manager and vice-president.

B. F. Goodrich Co.—**R. G. Jeter** was elected vice-president, general counsel and secretary, and **E. A. Stevens** was elected vice-president and treasurer.

Chrysler Corp.—**Lynn A. Townsend** was elected comptroller, and **H. F. Diegel** has been named chief of financial staff.

Le Roi Div., Westinghouse Air Brake Co.—**Don S. Permar** has been named assistant general sales manager.

Westinghouse Electric Corp.—**John H. Chiles, Jr.,** and **B. M. Brown** have been elected vice-presidents.

United-Carr Fastener Corp.—**Samuel A. Groves** was elected president, succeeding **Arthur W. Kimbell,** now chairman of the board.

National Malleable & Steel Castings Co., International Div.—**Ellsworth H. Sherwood** has been elected vice-president, and **Lawrence A. Pomeroy, Jr.,** has been promoted to assistant manager.

American Smelting & Refining Co. —**Kenneth C. Brownell** is now chairman of the board; **R. Worth Vaughan,** president; **Oscar S. Straus,** chairman of the Finance Committee; **R. D. Bradford** and **Forrest G. Hamrick,** directors; and **Kershaw Harms,** vice-president.

National Malleable & Steel Castings Co.—**Arthur D. Ott** has been named traffic manager.

Joseph T. Ryerson & Son, Inc.—Robert L. Larson has been made general manager of the new Indianapolis, Ind., plant.

American Chemical Paint Co.—George H. Williamson has been been elected vice-president in charge of West Coast activities.

Central Foundry Div., General Motors Corp. — **Frederick C. Hammer** has been appointed public relations director.

Stewart-Warner Corp. — **Augustus G. Douvas** has become director of the Patent Dept.

Babcock & Wilcox Co., Tubular Products Div.—**James S. Anderson** has been elected a vice-president.

American Bosch Arma Corp.—**Ernest M. Riggleman** was made a vice-president and asistant division manager, Arma Div.; **Clifton T. Foos**, vice-president for defense product planning; **E. D. Gittens**, vice-president and division manager, Arma Div.; **Ernest A. Goetz**, chief engineer, Arma Div.; **Richard J. Zeller**, corporate director of industrial security; and **Leslie D. Neville** and **Frederick H. Guterman**, corporate director and assistant director of advertising, customer, and public relations, respectively.

Black & Decker Mfg. Co.—**James W. Charbonnier** has been named director of industrial and plant engineering.

Temco Aircraft Corp. — **John A. Maxwell, Jr.**, has been promoted to vice-president in charge of sales and contract administration, and **Vernon N. Ferguson** has been made vice-president in charge of manufacturing operations for all plants.

Sealed Power Corp. — **Arnold E. Leder** is now manager of pricing and statistics.

Vickers, Inc.—**H. Charles Yaeger** was named manager of the new Jackson, Miss., plant.

Raybestos - Manhattan, Inc. — **Edward V. Huda** has become director of research and development for the Adhesives Dept.

Motor Wheel Corp. — **Stanley N. Johnson** was elected an executive vice-president and placed in charge of the Automotive Div.

Illinois Gear & Machine Co.—**E. C. Wilson** was elected vice-president.

Phoenix Mfg. Co., Rubber Div.—**W. L. England** was chosen sales manager.

Perfect Corp.—Walter J. Beyer has been promoted to manager of engineering and Robert G. Jenson succeeds him as chief engineer.

General Tire & Rubber Co.—**Michael O'Neil** was elected vice-president and executive assistant to the president.

National Tool Co.—**Arthur T. West** was named president, and **R. D. Lindstrom** was elected vice-president and general manager.

International Harvester Co., Motor Truck Div.—**Ralph M. Buzard** was appointed general manager; **William E. Callahan**, assistant sales manager; and **Louis W. Pierson** manager of sales.

Pratt & Whitney Co., Inc.—**Henry J. Fredericks** has been named controller-treasurer.

Yale Materials Handling Div., Yale & Towne Mfg. Co.—**Robert L. Brown** is now sales manager of gasoline and LPG industrial trucks, and **Charles E. Howard** has become sales manager for electric-powered trucks and truck attachments.

Warner Electric Brake & Clutch Co., Industrial Div.—**Wesley Timmcke** has been named manager of engineering.

Du Pont Co., Petroleum Chemicals Div.—**W. Samuel Carpenter, 3rd**, was named director of sales; **Alfred R. Mullis**, assistant director of sales; **Earl G. Bennett**, Eastern regional manager; **Donald W. Frison**, manager of the Central region; **Charles D. Towery**, manager of the Mid-Continent region; **R. Carter W. Jones**, sales service manager; and **Harold C. Thompson**, sales promotion manager.

Fruehauf Trailer Co.—**Bruce Kirsten** was appointed director of purchases.

Purolator Products, Inc.—John W. Puth has been appointed advertising manager.

Olin Mathieson Chemical Corp., Industrial Chemical Div.—James C. Laney is now manager of the Automotive Products Dept.

GMC Truck and Coach Div., General Motors Corp.—**Charles R. Lewis** was made an assistant chief engineer, and **Hans M. Gadebusch** was chosen a special projects engineer.

(*Turn to page* 194, *please*)

Necrology

Douglas B. Greig, 69, a former president of Ford Motor Co. of Canada, died Apr. 18, at Windsor, Ont.

Charles H. Brook, 74, former comptroller of Goodyear Tire & Rubber Co., died Apr. 11, at Savannah, Ga.

Dexter Kimball, 50, vice-president of Bendix - Westinghouse Automotive Air Brake Co., died Apr. 28, at Cleveland, O.

Raymond J. Russette, 53, assistant production control manager at the Dodge Main Plant of Chrysler Corp., died Apr. 23, at Detroit, Mich.

Norman L. Wolfe, 54, retired supervisor of new car distribution for Packard Motor Car Co., died Apr. 15, at Detroit, Mich.

G. Donald Spackman, 61, vice-president in charge of operations of Lukens Steel Co., died Apr. 14, at Coatesville, Pa.

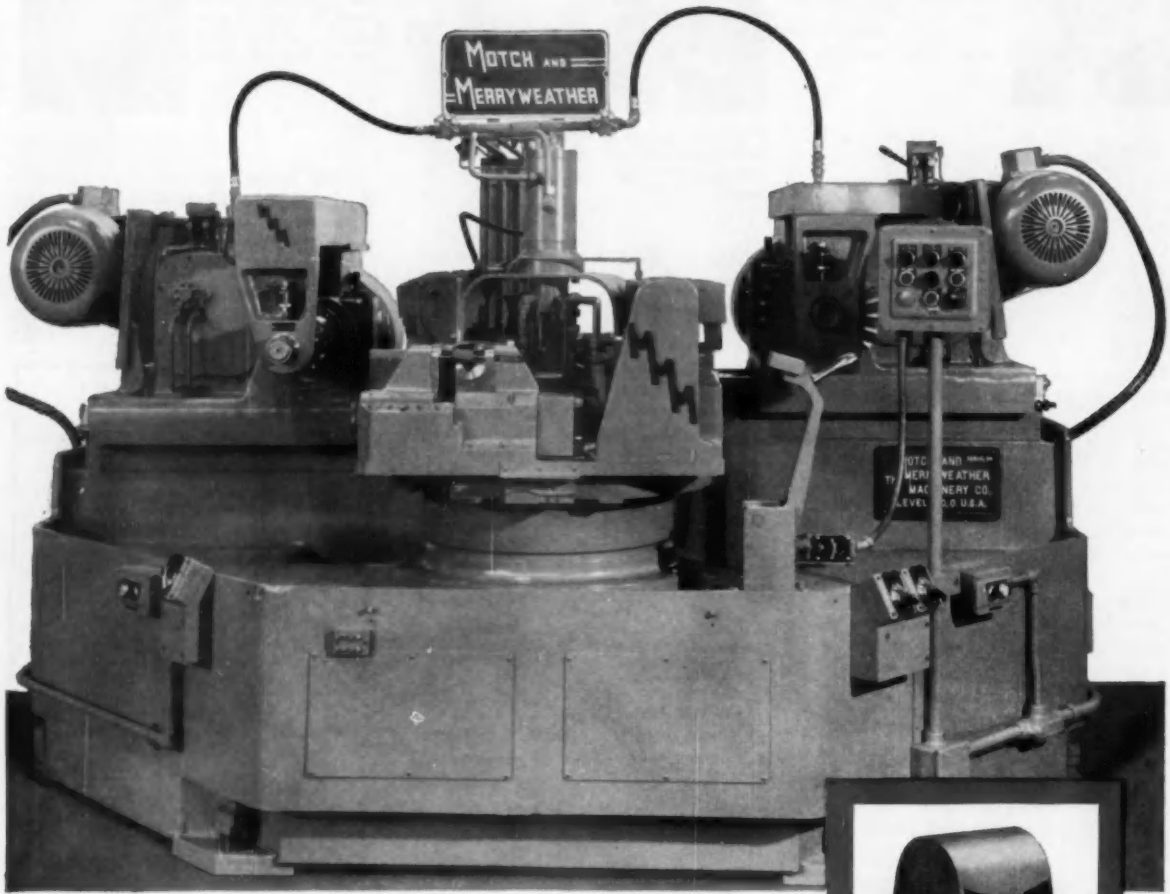
Howard L. Wynegar, 72, former president of Commercial Credit Co., died recently, at West Palm Beach, Fla.

Oscar P. Haas, 49, director of flight operations for Republic Aviation Corp., died Apr. 24, at Massapequa, L. I., N. Y.

Wendell E. Whipp, 73, chairman of the board of Monarch Machine Co., drowned Apr. 27, near Sidney, O.

John J. Hopkins, 63, chairman of the board of General Dynamics Corp., died May 3, at Washington, D. C.

Another specialized machine by M & M



Special duplex milling machine

for milling and slotting chain links

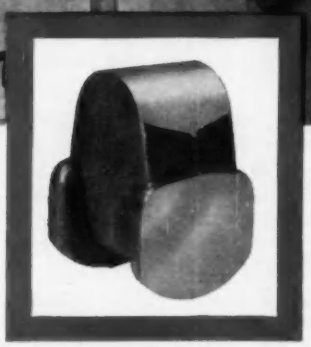
Operation—Straddle and form mill on right hand station, slot or straddle mill on left hand station.

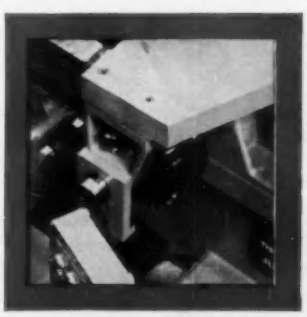
Universal—Six different sized parts run over this machine.

Cycle—Either automatic or manual cycle. Cycle time, 64 seconds.

Feed—Custom-designed and built hydraulic head feed, index and clamp.

Fixtures—Four fixtures are mounted on index table.

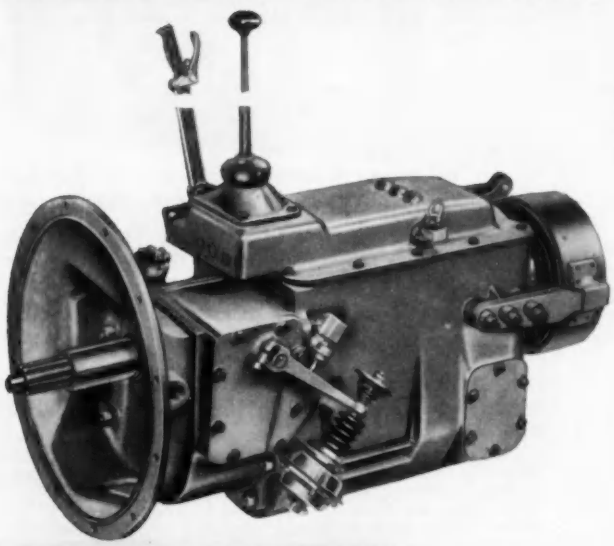




Heavy welded steel construction, annealed milling head and rugged, all-helical gear train in heads assure continuous production with a minimum of maintenance and costly downtime.

The
MOTCH & MERRYWEATHER MACHINERY
Company
MACHINE TOOL MFG. DIVISION
CLEVELAND, OHIO

Ideal for Highway Hauling-
CLARK stepMatic Transmission



Here's happy and profitable news for all operators whose truck equipment takes punishment—Clark's stepMatic Transmission. This transmission has proved particularly ideal for long-haul, high-speed operations.

- Ten speeds—splitting ratios in between the normal 5-speed transmission ratios—giving 28% steps to fit every hauling need.

Transmission gears synchronized. Semi-automatic shift for the splitting ratios

- Full control of gear-shifting at all times.
- Spares engine—the right ratio for every grade prevents engine lugging—decreases hauling time and fuel consumption.
- Increases transmission life—reduces shock loads. Less downtime for repairs.

By all means write for full information on this highway-proved achievement of Clark engineering.

CLARK® EQUIPMENT

TRANSMISSION DIVISION

CLARK EQUIPMENT COMPANY

Falahee Road • Jackson 2, Michigan

What specifications can't tell you about gasket performance

A resilient gasketing material may meet all pertinent government and industry specifications and still fail to provide a satisfactory seal in actual service. At the same time, a material that falls short of one particular specification may well be the most suitable for a certain application. This points up the fact that while specifications have a definite purpose and value, they are not to be relied on as a guide in selecting gasket materials for a new application.

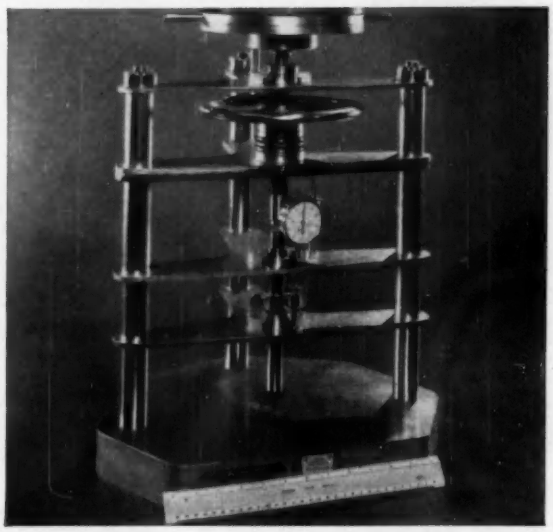
Specification testing is useful as a means of quality control after a suitable gasket material has been found—making sure that each succeeding shipment has the same physical and chemical characteristics. However, it is impossible to develop tests which will cover all the infinite possible combinations under which a gasket will function.

A brief look at some typical tests reveals their shortcomings. For example, many gasket specifications have rigid tensile strength requirements. Tensile strength is easily measured. Yet it usually has no bearing on the sealing ability of a material. Actually a gasket needs only sufficient tensile strength to hold its shape until it goes to work in the flange.

Tests for resistance to liquids are also unrealistic where uncompressed strips of gasket materials are completely immersed in various fluids. Test results may show intolerable changes in such factors as volume, compressibility, recovery, and elongation. In practice, however, only the edge of the gasket is exposed, and the effect of the fluid may be negligible.

Other tests—ream weight and bursting strength for two—have been lifted from the industry that produces the gaskets. Here they have value in helping to maintain quality. But they are of no help to people who use gaskets.

Compounding the difficulties of selection-by-specification is the lack of standardization in test procedures and instruments. In the matter of compressibility alone, there



This Armstrong-developed instrument is used to measure indentation and recovery characteristics of resilient gasketing materials. It is recognized by the National Bureau of Standards and is available commercially. Many laboratories now use this device to help standardize gasket testing.

are the variables of sample size, size and type of pressure foot, and the method and speed of load application.

The habit of buying by specification may delay the use of new and improved gasketing materials. Specifications need to be continually examined to see that they describe the materials of today rather than yesterday.

The common question, "Does it meet our specifications?" should be changed to, "Will it do the job better?" Once you can see that a material works better, establishing new specifications to maintain quality is no problem.

This device—called "the spider"—was built at the Armstrong Research and Development Center for use in developing and testing new gasketing materials under varying conditions of flange pressure, internal pressure, and temperature.

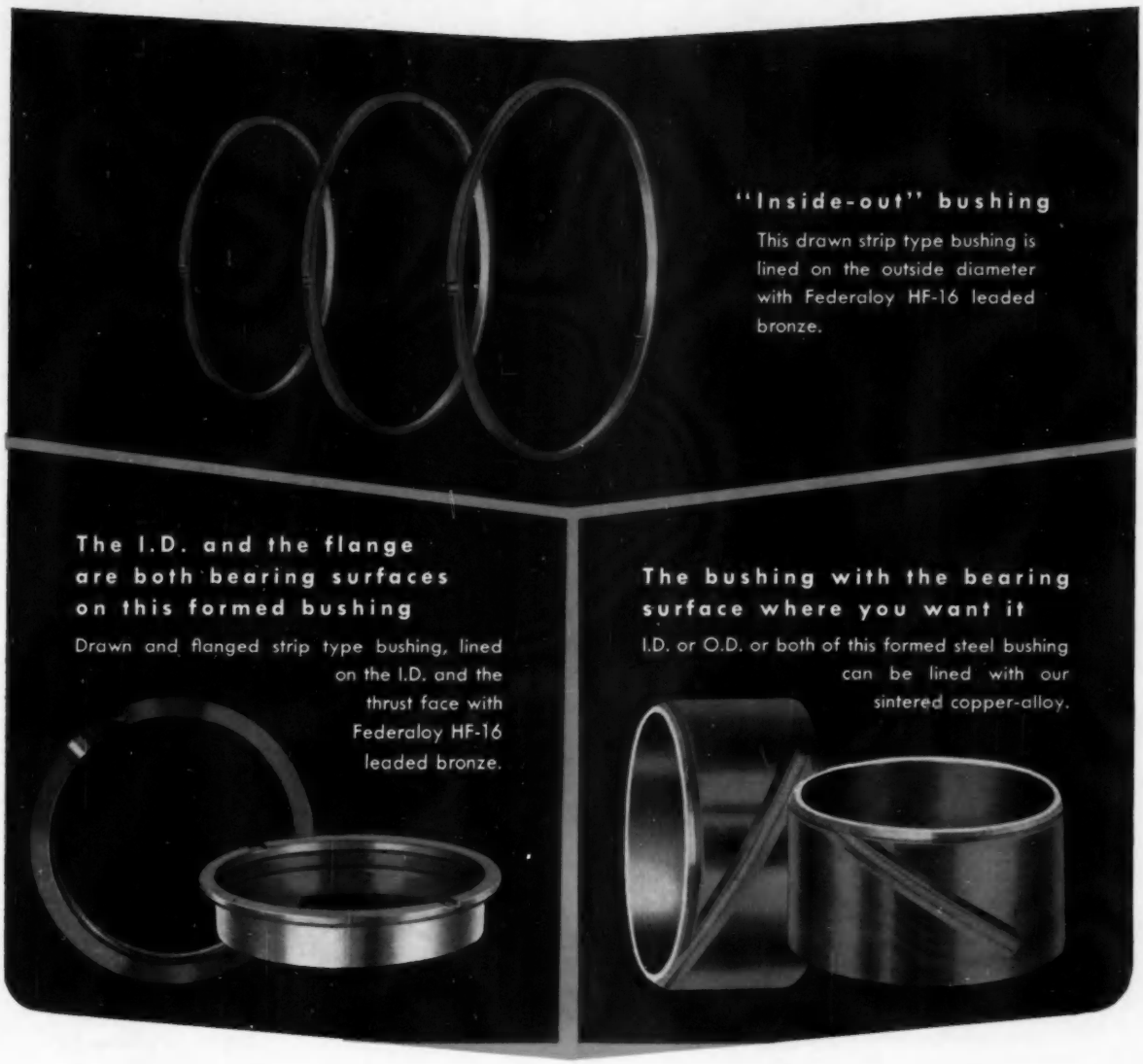
SEND FOR 1957 EDITION OF "ARMSTRONG GASKET MATERIALS"

This 16-page booklet discusses the choice of proper gasket materials and describes Armstrong cork, cork-and-rubber, synthetic rubber, and fiber sheet materials. Look for this booklet in Sweet's product design file. Or for a personal copy, write Armstrong Cork Company, Industrial Division, 7105 Imperial Avenue, Lancaster, Pa.

Armstrong

GASKET MATERIALS

. . . used wherever performance counts


"Inside-out" bushing
This drawn strip type bushing is lined on the outside diameter with Federaloy HF-16 leaded bronze.
The I.D. and the flange are both bearing surfaces on this formed bushing
Drawn and flanged strip type bushing, lined on the I.D. and the thrust face with Federaloy HF-16 leaded bronze.
The bushing with the bearing surface where you want it
I.D. or O.D. or both of this formed steel bushing can be lined with our sintered copper-alloy.

Where cost reduction is a factor . . . consider bushings with bearing performance

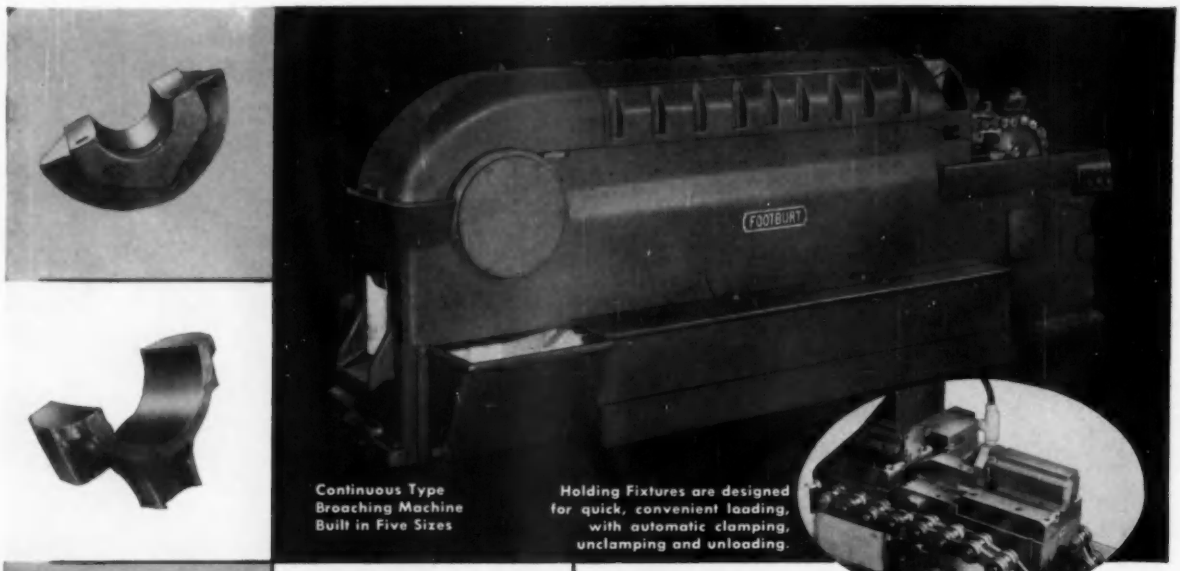
Our formed bushings and thrust washers are widely used for automatic transmission and other applications. They can be solid bronze or steel lined on either or both surfaces. Washers can be "lined" on both faces. Many special features can be incorporated—grooves, holes, nibs, ball indenting; straight, special or locking seams. We provide complete engineering service. Address:

FEDERAL Mogul SINCE 1899

FEDERAL-MOGUL DIVISION

FEDERAL-MOGUL-BOWER BEARINGS, INC., 11037 SHOEMAKER, DETROIT 13, MICHIGAN

RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING



Continuous Type Broaching Machine Built in Five Sizes

Holding Fixtures are designed for quick, convenient loading, with automatic clamping, unclamping and unloading.

machining connecting rods and caps an opportunity for

Surface Broaching

■ Surface Broaching is a modern machining method that in many cases shows reduced costs through higher production, finish to closer tolerance, and low tool maintenance costs. If you machine large quantities of duplicate parts we will be glad to work with you on the possibility of adopting Footburt Surface Broaching Machines. Send us blueprints and hourly production requirements for our recommendations.

THE FOOTE-BURT COMPANY

Cleveland 8, Ohio • Detroit Office: General Motors Building

FOOTBURT

PIONEERS IN SURFACE BROACHING

ZENITH®
CARBURETOR

has more experience in more fields with more engine types

than any other carburetor manufacturer

It just makes good sense—the more experience a manufacturer has in meeting a variety of problems, the better equipped he is to come up with a solution to your individual problems.

That's why when it comes to carburetors for passenger cars, trucks, buses, tractors, boats, off-the-road vehicles—in fact, wherever carburetors are used—the long, diversified experience of Zenith is your best assurance of outstanding performance at economical cost.

ZENITH CARBURETOR DIVISION, 696 Hart Ave., Detroit 14, Michigan
Export Sales and Service: Bendix International Division, 205 East 42nd St., N.Y. 17, N.Y.

ZENITH CARBURETOR DIVISION | Bendix AVIATION CORPORATION

Important Design Changes

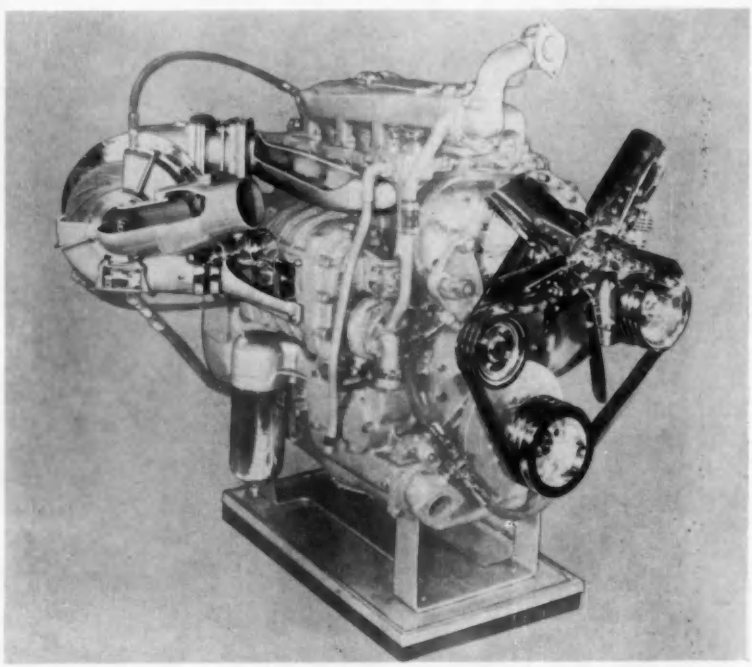
IN this special issue of AUTOMOTIVE INDUSTRIES devoted to matters of design it is pertinent to evaluate the impact of some of the special developments introduced in 1957 cars and to speculate upon their effect on future design. For this purpose we have selected a sampling of some unique features, although we do not contemplate a cataloging of all of the new ones.

STYLING—Since styling exerts such an important effect upon the character of the entire vehicle, let us look first at some of its distinctive elements. Perhaps the most conspicuous feature today is the low silhouette. Now so low that many people feel we have reached bottom, there is a feeling that stylists are aiming even lower. In fact, they contemplate the recessing of door openings in the roof panel to afford entry and egress.

Fins are another thing to consider. They have grown mighty big on some makes. Will fins persist or make way for some other design form? We recall a cartoon shown at the ACS Dallas meeting last year. On the basis of the then current trend in the size of plastic tail lamp bodies, the cartoon purported to show a statistical trend over the next 25 years. By that time it was visualized that the automobile would be a gigantic triangular configuration with the entire rear section a fin and tail lamp. The driver crouched in the apex at the front.

At the SAE Passenger Car Meeting in March, discussion of Val Roper's paper on the aiming of headlamps implied that all 1958 cars would employ dual headlamps. What is equally important, the factories would install simple mechanical fixtures for aiming directly on the assembly line. Thus the public would be assured of getting properly aimed headlamps when the car is delivered.

Recent discussion has focused attention once more on unconventional chassis arrangement. More and more stylists and designers are contemplating seriously the pros and cons of rear engine drives. While they are at it they will probably devote attention to front drive as well. Changing times and advancing technology make these configurations much more attractive and more feasible than they were 20 years ago.



Cutaway of the Detroit Diesel 4-71T, turbocharged Diesel engine used in 1957 GMC models. The turbocharger is seen at the left; the hydraulically driven fan at the right. The latter runs only when the engine requires cooling, stops automatically when cooling is not needed.

Air conditioning has come of age. With widening adoption there has been an incentive to further research. And this has resulted in the development of more compact packages, many including the conventional heating and ventilating system. The mechanism is all accommodated in the engine compartment and all are more attractively priced.

MATERIALS—Just a few comments may be pertinent on materials. The applications of aluminum are growing. Not only is it an extremely versatile material but it can be supplied in the most commonly known forms such as—sheets, bars, rods, extrusions, sand castings, die castings, permanent mold castings, and forgings. Extrusions, widely used for moldings and interior trim items, promise to expand into major applications such as bumpers, deck lids, hoods, etc.

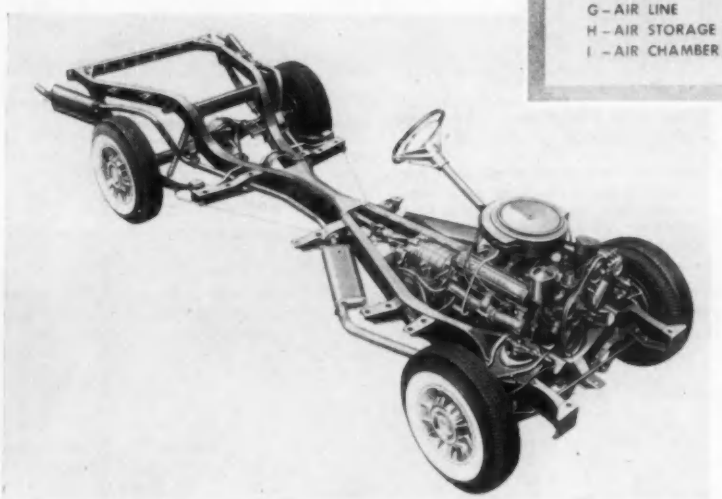
The use of plastics has been growing slowly. It was estimated recently that about 15¼ lb of plastic material will be found in the average car. One of the most noteworthy developments in this connection is the manufacture of clear plastic parts selectively plated by

in Modern Cars

By Joseph Geschelin

A – LATERAL STAY BARS
B – LEVELING VALVES
C – SWAY BAR
D – AIR BELLOWS
E – TORQUE RODS
F – AIR BEAM
G – AIR LINE
H – AIR STORAGE TANK
I – AIR CHAMBER, PART OF AXLE

Air suspension has been widely adopted for heavy duty vehicles, although the only application for passenger cars is on the limited production Cadillac Eldorado Brougham. The GMC suspension employs air bags or bellows, controlled by leveling valves to keep floor height at constant level.

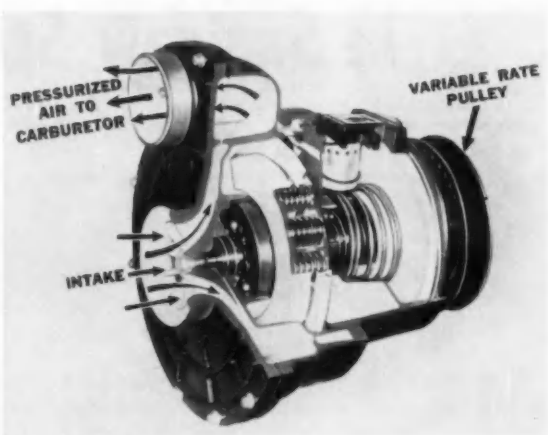


At left is shown the Cadillac frame configuration. Said to have extra torsional rigidity, it permits lowering the floor by about three inches. It secures the body by means of outriggers.

the vacuum-metallizing technique. Ford has an arc-shaped clear plastic instrument panel section which contains a plated rim and has the appearance of a glass and chromium-plated bezel assembly. This is one of the best examples of the utility and economy of the new technique.

Stainless steel too has shown vigorous growth in automotive applications and is competing actively with other materials.

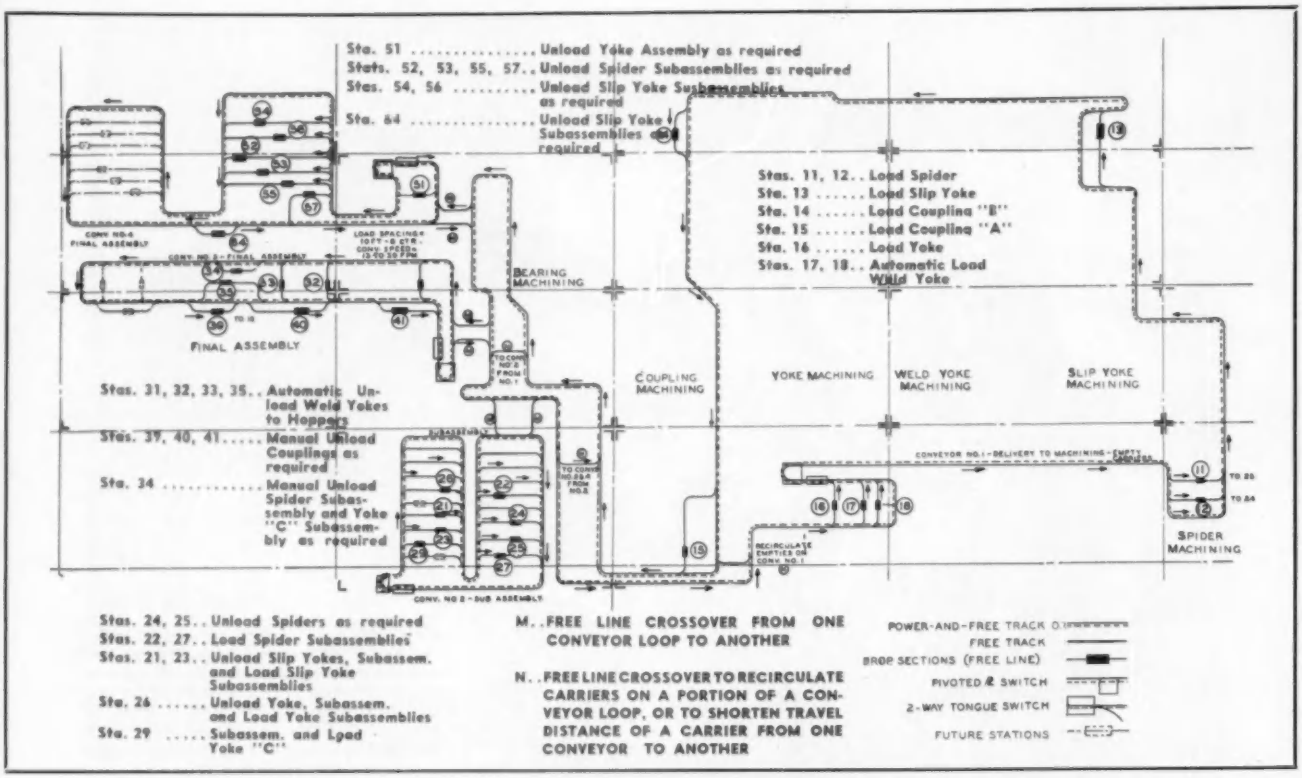
Glass has become a phenomenon what with the enormous expanse of complex wraparound safety windshields and heat treated rear window glass. Concurrently the Imperial stands alone with curved glass for the doors.



This is the McCulloch supercharger installed on the 289-cu. in. V-8 engine in the Studebaker Golden Hawk. It is claimed to add up to 15 per cent better performance. Driven through a variable rate pulley the supercharger produces maximum power during acceleration, permitting normal fuel economy at cruising speeds.

TRANSMISSIONS—AI readers are familiar with the changes that have taken place in automatic transmissions. For 1957, the Chrysler Torque-Flite three-speed transmission completely replaced the former PowerFlite unit. Addition of a low gear provides still greater acceleration on starts. Moreover, it is more quiet and smoother

(*Turn to page* 111, *please*)


Sta. 51 ..... Unload Yoke Assembly as required
Stats. 52, 53, 55, 57.. Unload Spider Subassemblies as required
Stas. 54, 56 ..... Unload Slip Yoke Subassemblies as required
Sta. 64 ..... Unload Slip Yoke Subassemblies as required
Stas. 11, 12.. Load Spider
Sta. 13 ..... Load Slip Yoke
Sta. 14 ..... Load Coupling "B"
Sta. 15 ..... Load Coupling "A"
Sta. 16 ..... Load Yoke
Stas. 17, 18.. Automatic Load Weld Yoke
BEARING MACHINING
FINAL ASSEMBLY
COUPLING MACHINING
YOKE MACHINING
WELD YOKE MACHINING
SLIP YOKE MACHINING
SPIDER MACHINING
Stas. 31, 32, 33, 35.. Automatic Unload Weld Yokes to Hoppers
Stas. 39, 40, 41..... Manual Unload Couplings as required
Sta. 34 ..... Manual Unload Spider Subassembly and Yoke "C" Subassembly as required
Stas. 24, 25.. Unload Spiders as required
Stas. 22, 27.. Load Spider Subassemblies
Stas. 21, 23.. Unload Slip Yokes, Subassem. and Load Slip Yoke Subassemblies
Sta. 26 ..... Unload Yoke, Subassem. and Load Yoke Subassemblies
Sta. 29 ..... Subassem. and Load Yoke "C"
M.. FREE LINE CROSSOVER FROM ONE CONVEYOR LOOP TO ANOTHER
N.. FREE LINE CROSSOVER TO RECIRCULATE CARRIERS ON A PORTION OF A CONVEYOR LOOP, OR TO SHORTEN TRAVEL DISTANCE OF A CARRIER FROM ONE CONVEYOR TO ANOTHER
POWER-AND-FREE TRACK
FREE TRACK
DROP SECTIONS (FREE LINE)
PIVOTED R SWITCH
2-WAY TONGUE SWITCH
FUTURE STATIONS

Schematic layout of J. B. Webb power-and-free conveyor system which covers the entire floor area. As described in the text, Conveyor system No. 1 picks up carrier loads of parts at the designated loading points on each machine line and transports them to Conveyor No. 2 which delivers the parts to the sub-assembly stations at the lower left. Conveyors No. 3 and 4, in turn, serve the two main assembly lines.

FIG. 1

Making Propeller Shaft Assemblies in Saginaw Steering Gear Plant

PART II

By Joseph Geschelin

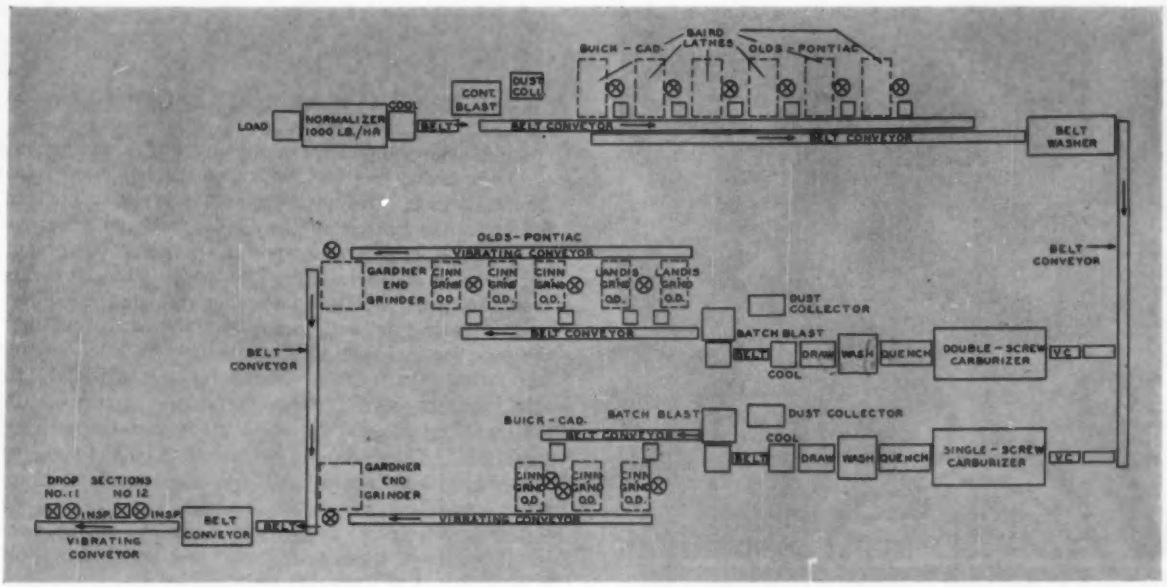
MUCH of the detail concerned with the layout of the plant and arrangement of machine lines of the Saginaw Steering Gear Div., Plant 4, appeared in an article recently (see AI, April 15, 1957).

This article deals with the power-and-free conveyor system designed and installed cooperatively by SSG and Jervis B. Webb; machining of the universal joint spider; and a summary of assembly stages on a typical three-universal-joint propeller shaft assembly.

The power-and-free conveyor system traverses every section of the plant, providing a fully automatic means for transporting parts and sub-assemblies to the final assembly area. The general scheme is shown in Fig. 1, indicating the location of major machine lines (described in Part I), the sub-assembly area, and the two final assembly areas at the upper left of the drawing.

It is noteworthy that all lift stations on the power-and-free system are equipped with ball bearing nut and screws manufactured by SSG.

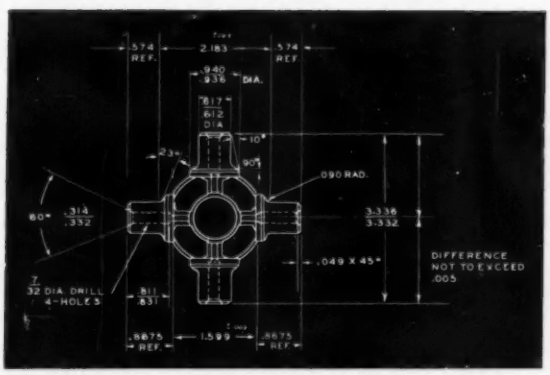
Conveyor No. 1, the most extensive of the four lines, is some 1600 ft in length and describes a path that communicates with lift stations serving each of the machine lines. For example, in the coupling area Stations 14 and 15 pick up the two kinds of couplings. In the yoke machining area, Station No. 16 picks up the



Arrangement of machine department for the complete sequence of operations on spiders. It will be noted that two different spiders are processed here, each one having its own operational sequence.

FIG. 3

FIG. 2



Typical universal joint spider. This sketch shows the dimensions and tolerances specified for the Baird automatic lathe operations detailed in the text.

internal splined yoke, whereas Stations 17 and 18 pick up the welding yokes. Stations Nos. 11 and 12 are for loading the spiders, described later in this article. In each instance, the station is provided with an automatically functioning lift for hoisting carriers loaded with parts up to engage the main conveyor line.

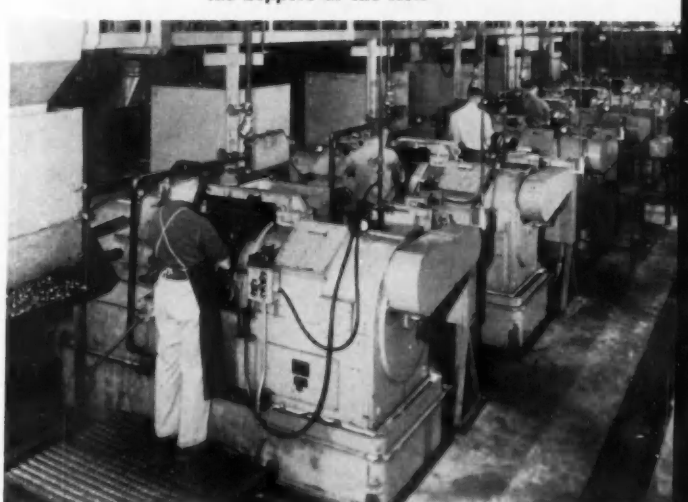
The same conveyor (No. 1) recirculates empty carriers and delivers them to the proper station as soon as the station can accommodate an empty.

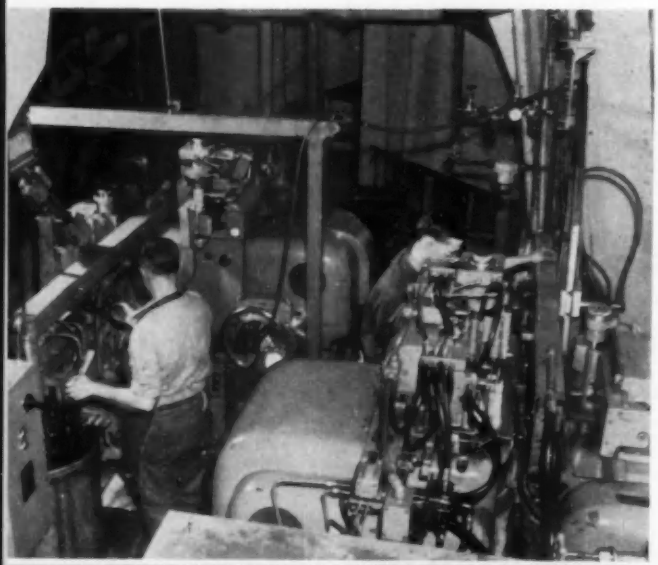
Near the left side of the layout (Fig. 1) the several points marked "N" indicate a "free" line cross-over from one conveyor loop to another, providing the transfer from Conveyor 1 to Conveyor 2, for example. Conveyor 2, about 375 ft long, transports the finished parts which are picked up in the machine area by Conveyor 1 and delivers them to assigned stations in the sub-assembly department. The cross-over of carriers on Conveyor 1 is made at "N" in the vicinity of the bearing machining bay.

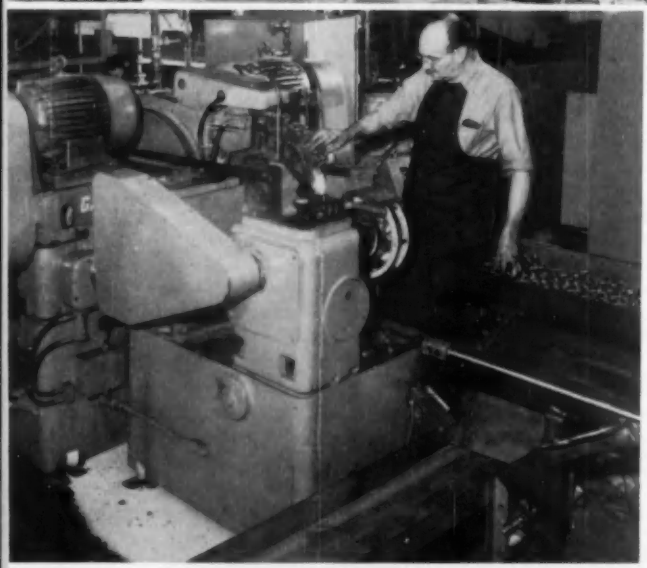
The assembly area is divided into two separate sections to handle the different types of propeller shafts, i.e., two-joint, and three-joint types. The three-joint type is the one that came into production on a number of General Motors cars this year.

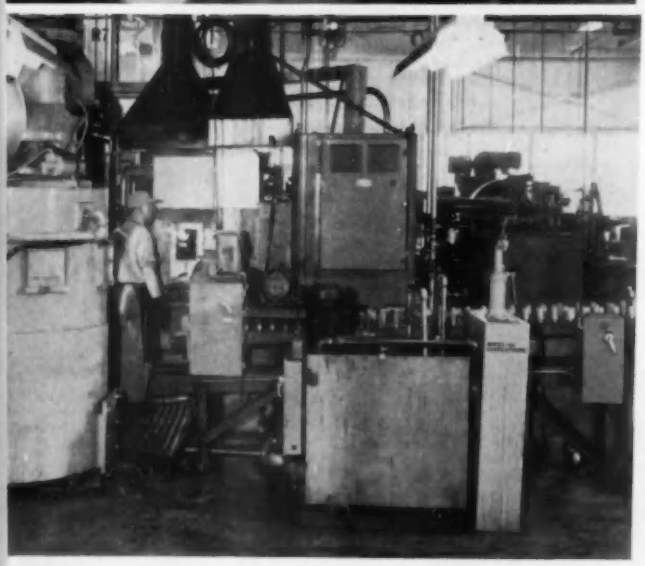
Each of these assembly sections is served by a different conveyor system. Conveyor 3 runs about 416 ft in length, while assembly Conveyor 4 has a developed length of 538 ft. As shown in Fig. 1, the cross-over from Conveyor 2 to systems 3 and 4 is made at point "N" which is to the right of the sub-assembly department. The legends in the assembly area indicate the

Part of the battery of Baird, duplex Type No. 4 automatic turning machines. Of 12-station design, the machines hollow-mill, drill, and countersink the four spider trunnions in two passes. Note the feeding of machines from the hoppers at the left.









Perspective of the automatic cycle Landis No. 12 centerless grinders for finish-grinding of the four trunnions of the universal joint spider. Detail of the automatic loading and indexing mechanism may be seen on the machine at the left.

Grinding the ends of spider trunnions is done in this double-end Gardner grinder provided with trunnion-mounted fixtures and mechanism for turning alternate parts by 90 deg.

View in slip yoke department, described in Part 1 (see AI, April 15, 1957) showing the Westinghouse induction hardening machines for deep hardening of the slip yoke splined end.

various stations at which specific parts are unloaded manually or automatically.

Let us now consider the routing and arrangement of the machine line for producing the universal joint spider, Fig. 2. Ordinarily a rather complex part to finish, it has been simplified in operational sequence through the adoption of special automatic equipment for turning and grinding. The major advance stems from the development of unique mechanism for loading and unloading as well as for automatically shuttling the part for the second index required in finishing the four arms. Starting as a rough forging of SAE 6115 steel, the spider is turned overall in a group of 12-station, duplex Type No. 4 Baird automatic turning machines. These machines complete the following operations: hollow-mill, drill, and countersink the four trunnions in two passes.

The spider now goes to heat treat—wash; carburize, quench, wash and draw; and grit blast. Following this, the work proceeds to No. 12 Landis centerless grinder for finish-grinding of the OD of the four trunnions. Secret of the success of this phase of the operation lies in the magazine feed to the machine; delivering the parts one at a time; and the unique shuttling mechanism for loading, removing from the work station, indexing for the second pass, and returning to the work station, all done rapidly and automatically.

Final operation — grinding the ends of the four trunnions—holding overall length to a total tolerance of 0.001 in.—is done in a Gardner double-end grinder provided with automatic index and eject mechanism for trunnion-mounted fixtures.

The arrangement of the machine line for spiders is shown in Fig. 3. It will be noted that two different types of spiders are handled in this department. Both start at the upper left, forgings being loaded into a hopper serving the normalizing furnace. The parts then continue into a continuous blasting machine and are ejected onto an overhead conveyor traversing the battery of six Baird automatic lathes.

Upon leaving the turning operations, the spiders are transported on the adjacent belt conveyor to the washer, then by belt conveyor to one of the two process lines below. Since the operations are quite similar we can consider just one of these lines, say the upper one. Here the parts are diverted to a vibrator con-

veyor section and loaded into the heat treating equipment. Following completion of this cycle, the work comes out on a belt conveyor and enters a batch type shot blasting machine. The parts then are fed into the setup of centerless grinders. We have concentrated attention on the Landis grinders since these are of the latest type and feature the unique provisions for feeding, and shuttling for the double index.

As the spiders come out of the grinders they drop onto the vibrating conveyor and are transported one by one to the Gardner double-end grinder for grinding the ends of the trunnions to length.

Parts from both grinding lines are collected on the belt conveyor at the left and transported to the washer, then to the two inspection stations. At this point the operators load the spiders into carriers at the proper drop station — either No. 11 or 12.

Having traced the machining of the four major components, let us take a brief look at a typical assembly of a three-joint propeller shaft. The sequence of major steps in the process is given below:

Center Bearing Assembly: Assemble bearing and retainer; grease both sides; assemble four bolts, washers, plate and slinger, and start four nuts. The nuts are made up with a Thor nut runner, holding torque to 14-17 lb.

Front Prop. Tube Assembly: Press-in cardboard liner; press weld yoke and coupling into tube and weld. It may be noted that this seam-welding operation is done in CO_2 welding machines. Broach between ears of yoke, using a 10 x 66 Cincinnati twin-ram broaching machine. Broach cross holes, using a 10 x 42 Detroit Broach.

Front Prop. Shaft Assembly: Assemble spider assembly to tube assembly with two bearings and two snap rings. Assemble two slingers and center bearing assembly to the coupling end of tube and grease. Straighten and inspect.

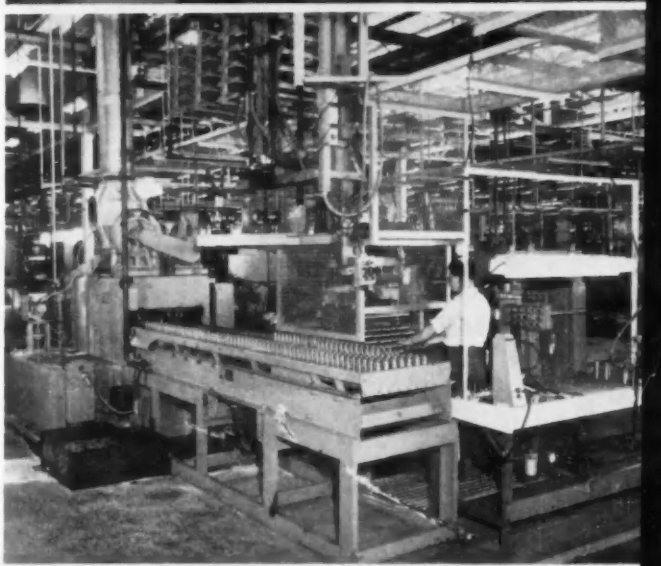
Rear Prop. Tube Assembly: Press in cardboard liner; press two weld yokes into tube, then weld and paint identification stripe. Here too the welding is done in CO_2 welding machines. Broach between ears of the yokes in a 10 x 66 Cincinnati twin-ram broaching machine. Broach cross holes in a 10 x 42 Detroit broaching machine.

Rear Prop. Shaft Assembly: Assemble two round bearings and two snap rings to slip yoke assembly. Assemble a spider and round bearings to one end of the propeller tube. Assemble the slip yoke assembly to the propeller tube assembly with two round bearings and two snap rings. Straighten and inspect.

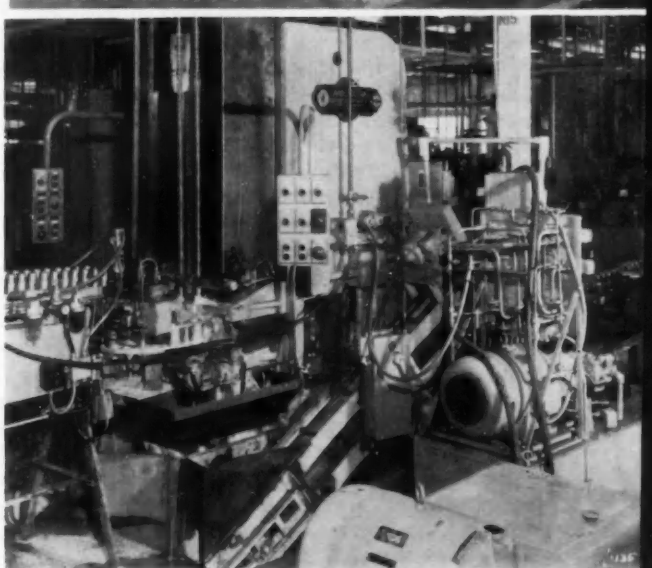
Front and Rear Prop. Shaft Assembly: Grease external spline slip yoke; assemble slinger and lock washer to slip yoke and assemble front and rear prop shaft assemblies. Balance the entire assembly in a GMR horizontal balancing machine.

It may be noted that in describing the arrangement of the spider machine line we did not indicate the means for transfer from one conveyor section to another. This involves so much detail that we felt it would be easier to visualize from the photographs reproduced here.

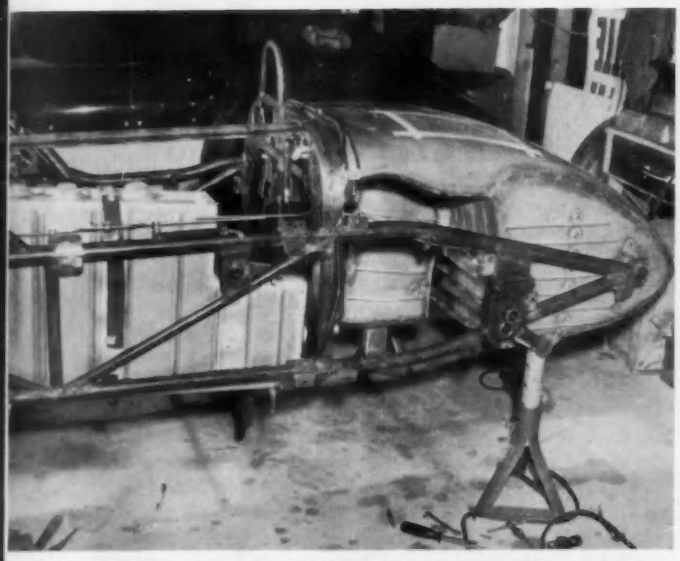
This view in the slip yoke department highlights an interesting machine supplied by Olofsson for drilling roll pin holes in Buick slip yokes. It handles two parts at a time.



The plant is provided with a large number of washing machines of varied sizes and types. Here is an example of one of the Peters-Dalton washers on the spline coupling line. This one is built around a Simplicity vibrating conveyor to provide automatic transport.



Internal splines in one type of coupling are broached in the vertical type American broaching machine seen here. Loading and unloading is fully automatic.



BELOND SPECIAL *Left side view of Belond Exhaust Special showing tanks and part of chassis frame*

New Belond Exhaust Special with Sam Hanks in the driver's seat

New Cars and Engines

Smaller, Lighter Chassis and Bodies Have Been Designed for the New Engines of Less Piston Displacement

RACING fans the world over will have their eyes glued on the 41st annual 500-mile race at the Indianapolis Speedway May 30. And they can be sure the Speed Classic won't let them down. The grind will again be packed with thrills.

Predictions—It will take 140 mph to get one of the 33 coveted starting positions, and the average speed for the race should be a sizzling 136 mph.

This year's cars will be narrower, smaller, lower, and lighter, and new engine specifications are in effect for the first time this year. The Speedway cut piston displacement from 274 cu in. to 256 cu in. for non-supercharged engines, and from 183 cu in. to 171 cu in, for supercharged.

Speedway President Tony Hulman believes this a safety factor. The use of smaller engines will serve as a check on the steadily increasing speed rates. And he hopes that the cuts in piston displacement are a step in the right direction on another score: agreement with the Federation Internationale l'Automobile on standard engine sizes for world-wide championship events. Everyone would welcome more foreign competition at the Speedway.

Incidentally, the top ten Indianapolis drivers are slated to take their cars to the famous Monza race in Italy.

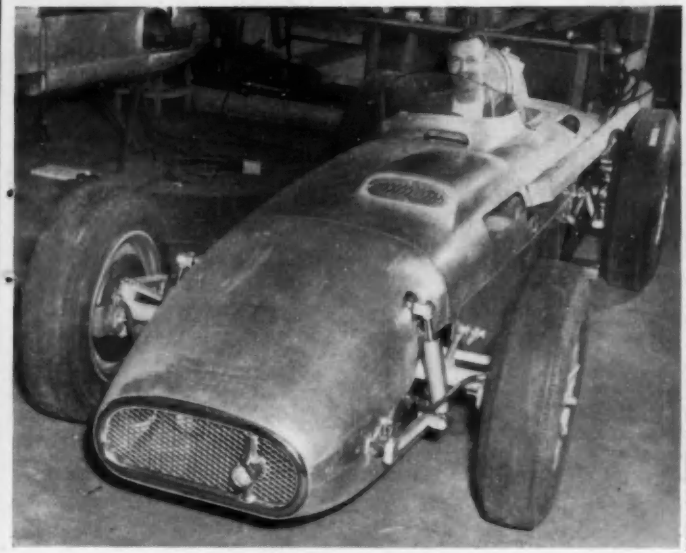
All but four of the 54 Indianapolis entries will have the famous 4-cyl Meyer & Drake Offenhauser engine. Leo Goossen, M & D's chief design engineer, says the reduced displacement meant changes; new cylinder blocks with smaller bores and, in some cases, new crankshafts with shorter strokes. Meyer & Drake made about 50 new cylinder blocks, some 15 new crankshafts, and new pistons. The 1957 bore-stroke combinations range from 3.156 bore by 4.625 stroke to 4.375 bore by 4.250 stroke. The popular size is 4.218 bore by 4.500 stroke.

The smaller displacement delivers about 10 per cent less horsepower.

Three-time Indianapolis winner Lou Meyer, vice-president of Meyer & Drake, told AUTOMOTIVE INDUSTRIES that the smaller displacement is a good thing. "It will test the mettle of the drivers to get the best possible performance from their engines."

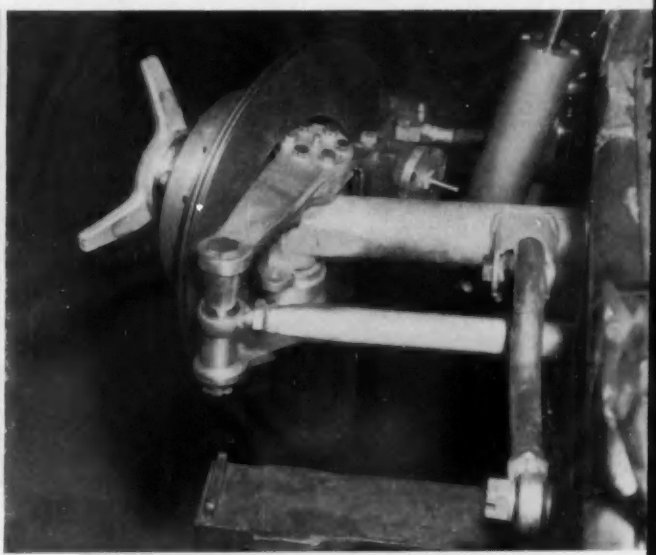
ENTRIES INCLUDE 22 NEW CARS

There will be 22 new cars entered this year; that's



Jim Robbins Special, one of the new Kurtis Model 500-G-2s, with driver Chuck Weyant

JIM ROBBINS SPECIAL



Looking forward to left end of front axle in Jim Robbins Special

PEP UP INDIANAPOLIS 500

probably the largest number in Indianapolis history. Frank Kurtis is building 14 of them—Model 500 G-2s. They'll replace older cars and weigh about 1670 lb dry — some 150 lb less than his previous models. Twenty-four to 26 of the qualifying cars will be Kurtis-built.

George Salih's Belond Exhaust Special is the most talked-about car to enter the competition in years. It represents a change in design thinking. Here's a rundown:

The car is shorter, smaller, lower, and lighter. Center of gravity is possibly lowest of any car to appear at the Speedway. The designer did it by mounting the engine 18 deg from horizontal. This gives the hood much less area to cover so it's lower and much shorter than if it had to cover an upright engine.

Dimensions: length 13 ft 1½ in.; top of tail fin to ground height, 35 in.; top of hood to ground at front axle, 21 in.; width, 35 in.; wheelbase, 96 in.; ground clearance, 4 in. plus.

Quinn Epperly designed the body, fuel tanks, and a special aluminum seat contoured to the driver's body. The tubular steel chassis frame uses diameter sizes from ¾ in. to 1½ in. The body shell of 16 gage aluminum panels is attached with Dzus fasteners.

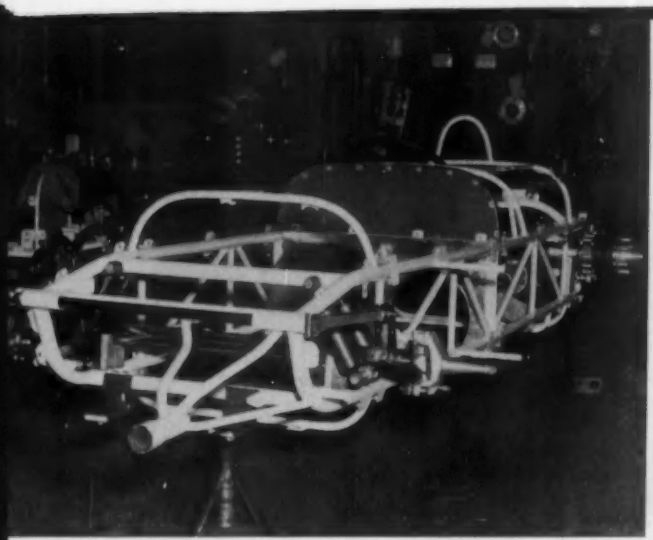
Can a race engine lie on its side and run successfully? The Indianapolis grind will tell. Here's how builder George Salih placed the engine. It is mounted 5 in. to the left of the car's center. Lying on its right side at an 18 deg angle from horizontal, its weight centers on the left side of the car.

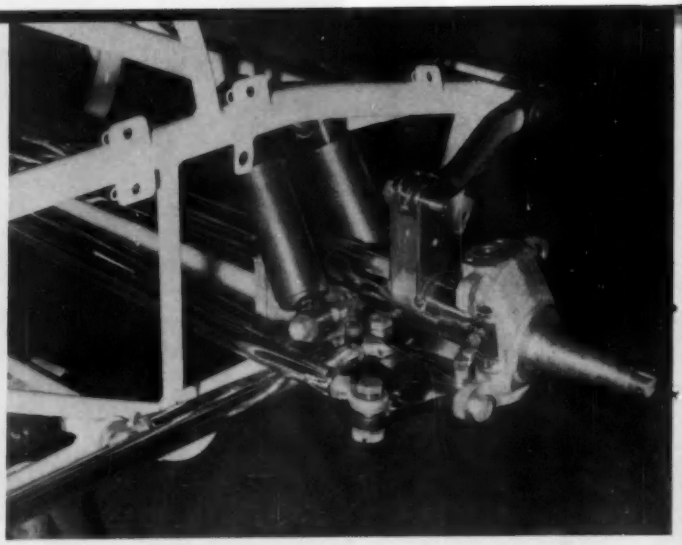
His reasoning: The arrangement lowers the center of gravity; the horizontal position of the engine lets the hood be much lower and shorter; with the driveshaft on the driver's left, he can sit lower in the car. He'll be 2 in. above the floor.

By R. Raymond Kay

The powerplant is a Meyer & Drake 4-cyl with modifications for horizontal installation. It was necessary to make a new oil sump, mounted in place of the conventional crankcase side plate. Specifications: 251 cu in. displacement; 4.156 in. bore; 4.625 in. stroke; two gear-driven overhead camshafts which actuate two intake and two exhaust valves for each cylinder.

(*Continued on next page*)





Chassis of the 1957 John Zink Special designed and built by A J Watson Weighing 1585 lb dry, this is one of the lightest entries Above is shown steering linkage, shock absorbers, etc of the John Zink Special

JOHN ZINK SPECIAL

Rated horsepower is 325 at 5500 rpm. Car weight is 1650 lb dry; 2300 lb with fuel and driver. Perfect Circle piston rings are used. Equipment includes a Hilborn fuel-injection system using methanol. George Salih hopes to get about 5 mpg.

The car uses Halibrand four-wheel spot brakes with hydraulic cylinders clamping a new Raybestos brake lining on each side of the exposed brake disks. All brake lines are stainless steel tubing. Each wheel has a single Monroe telescope-type shock absorber. Also installed are Halibrand rear end and steering gear.

NEW KURTIS MODEL

Kurtis' new 500 G-2 series is lower, shorter, narrower, and lighter than previous models. This trend, noticeable at the track last year, continues with most race car builders. Drivers like the better visibility, control, and performance.

This year Kurtis put the oil tanks in the right front corner of the chassis. He expects it will make better handling and stabilization. Also, it should get the heat out of the cockpit for more driver comfort.

Dimensions: overall length, 14 ft 3 in.; weight, 1675 lb; headrest-to-ground clearance, 34 in.

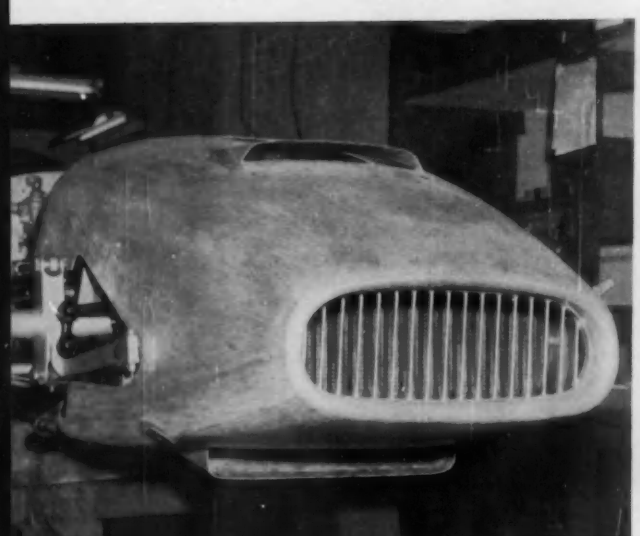
A left-side driver's seat and engine on the right are features of three entries built by Kurtis; the Ed Walsh car and the two Bardahl Specials. The idea is to provide better visibility and to put the drivers farther away from the outside wall of the track. "Wall neurosis" is a big thing with them. The owners hope this driver-engine layout will allow faster speeds through the turns and on the short stretches between turns. The engine is offset 5 in. to the right.

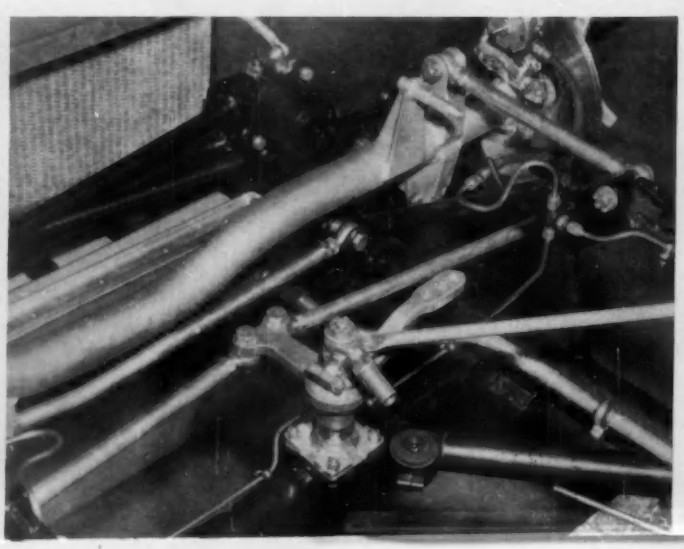
The two Bardahl Specials are streamlined roadster-type racers with Kurtis 500 G-2 chassis. The accent is on a low-look design. Both cars have 255 cu in. Offenhauser engines with Hilborn fuel injectors.

Bardahl is thinking about installing an oxygen system to protect the driver against exhaust fumes and heat prostration. A small aircraft-type unit may do the job. It's never been tried at the Speedway and would be an interesting development—if it works.

Front view of Novi Special. Top air scoop is air intake for carburetor, bottom scoop below radiator is for oil cooler. Below is shown front axle and steering linkage of Novi Special. Chassis is 1956 Kurtis 500-G

NOVI SPECIAL





JOHN ZINK SPECIAL

Thirty-one-year-old winning mechanic A. J. Watson —his cars got the checkered flag in 1955 and 1956— has a new John Zink Special up his sleeve. Watson did a lot of heavy thinking to reduce the car's weight. He came up with a 1585-lb-dry job.

The problem was how to squeeze in big 6 ft 2 in., 210-lb driver Troy Ruttman. Watson had to enlarge the cockpit to get him in.

The fuel tank carries 59 gal instead of last year's 77. Loaded with fuel and with Ruttman in the car, the weight will be 150 lb below last year's winner.

Here are some of Watson's weight-saving techniques: fiber glass tail assembly (10 lb saving); hood metal 0.050 in. aluminum sheet; all other metal sections 0.050 in. magnesium sheet. The entire body, without the frame, totals only 64 lb.

Changes in this year's car are placement of radius rod on right side and sway bar directly behind and running parallel to the front axle. Watson mounts an 8-gal outrigger-type oil sump tank of terne plate coated with white fiber glass.

CHIROPRACTIC SPECIAL

Watch for one of the longest cars in Indianapolis history to show up—the Chiropractic Special entered by Dr. R. N. Sabourin. Built by George Shilala, this car stretches 15 ft 4 in. It's 32 in. high at the cowl, and measures 45 in. from top of headrest to ground.

Front tread is 56 in., rear 48 in.; wheelbase 96 in.; total weight 1725 lb; nose scoop openings 7½ in. high. 18 in. wide.

A feature of this car is adjustable torsion bar mounting brackets on front and rear. These allow raising and lowering 4 in. in front, 3 in. in rear.

TWO NOVIS READY

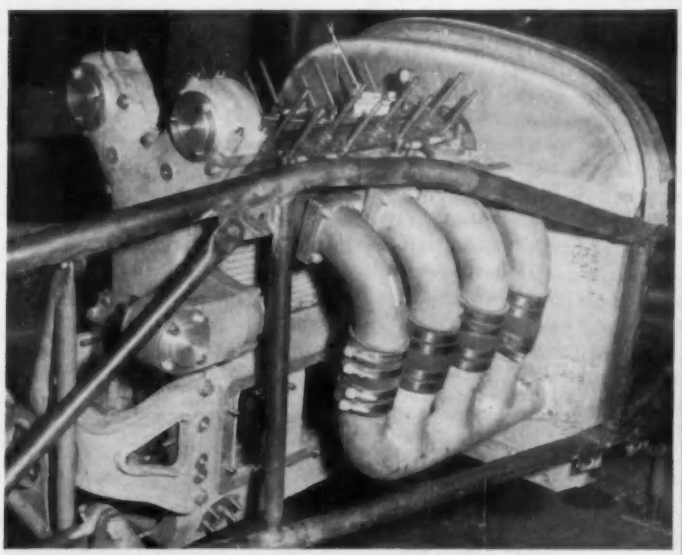
The never-say-die Novis will again make a try for honors. Two cars, admitted by automotive engineers to be the track's most powerful, are in shape to go.

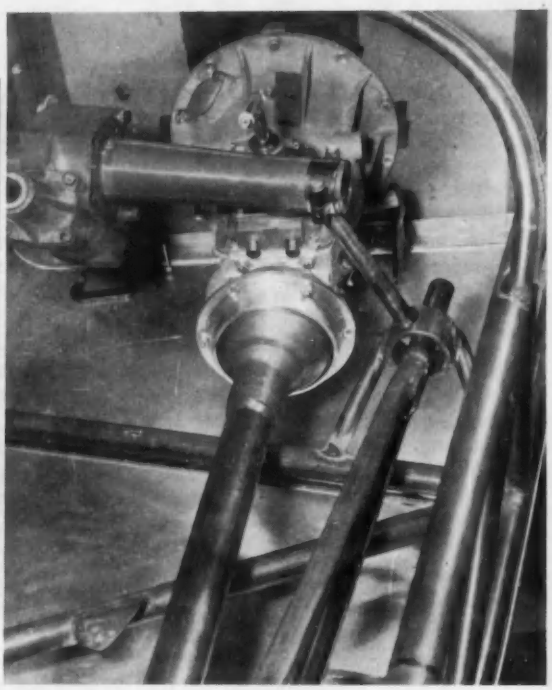
Chief mechanic Jean Marcenac says the cars will carry 86 gal each, probably the largest fuel capacity of any car this year. Front brakes are single spots instead of double; rear ones remain double. Many builders believe this combination gives better braking.

There are three air scoops in the nose. The top one is for the modified side draft Holley aircraft carburetor, the center scoop is for water radiator intake, and below is a new air intake for the horizontal oil cooler radiator located under the water radiator. The oil cooler is 19 in. long, 4 in. high, 5 in. wide.

To meet this year's new rules Marcenac reduced piston displacement of the 183-cu in. supercharged engines to 171 cu in.

Illustration at right is looking down into cockpit of the Wolcott Special. Diagonally located engine requires two universal joints





Supercharged 165 cu in. Offenhauser engine in Wolcott Special

WOLCOTT SPECIAL

WOLCOTT SPECIAL

A car with a greatly angled engine mounting is the Wolcott Special. Builder Lujie Lesovsky and mechanic Herb Porter set the engine in a 13 deg diagonal angle from the fore and aft center line of the car. The engine's center of gravity is 3 in. to the left of the car's center line. The driver also sits on the left side. This puts a greater proportion of the sprung weight on that side.

This 1600 lb car will have a 155 cu in. supercharged

Casale-Greenman Special uses V-type sway bar and radius arm running from front engine support CASALE-GREENMAN SPECIAL

engine. Herb Porter, working on an Offenhauser supercharger for almost 10 years, believes he can get 530 hp from the supercharged engine with Hilborn injectors.

The drive is taken through two constant-velocity Rzeppa universal joints to a standard Halibrand rear end. They run at a constant angle of approximately 5 deg at the rear and 8 deg at the front.

The rear end torque on the live Halibrand rear axle is absorbed by a laterally hinged torque arm. This allows more freedom to the rear axle than the conventional rear end.

LINDSAY HOPKINS ENTRY

Big car with a small look; that's the Lindsay Hopkins entry this year. The big-framed car is low in height and moderately streamlined. Top-of-headrest to ground measurement, 38 in., with 4 in. ground clearance. Builder Quinn Epperly had his design stress analyzed by aircraft engineers.

CASALE-GREENMAN SPECIAL

A new car from Eddie Kuzma's Los Angeles shop, the Casale-Greenman Special, also stresses a lower, narrower body line. Top of the body will be below the tops of the tires. Front axle assembly features torsion bars mounted low and under the front axle. On top of the front axle, a radius rod like that which was used on the Model T Ford, eliminates a sway bar and reduces weight. It's fastened to the front axle at two points, and is then anchored to the center of the front motor support. Heim rod ends allow for front axle vertical and lateral movement.

Kuzma's Dean Van Lines car, completely rebuilt, will show up with body narrowed 7 in. and wheel tread 4 in. The builder lightened the chassis this way for the smaller displacement engine, and it turned up a weight saving of 112 lb.

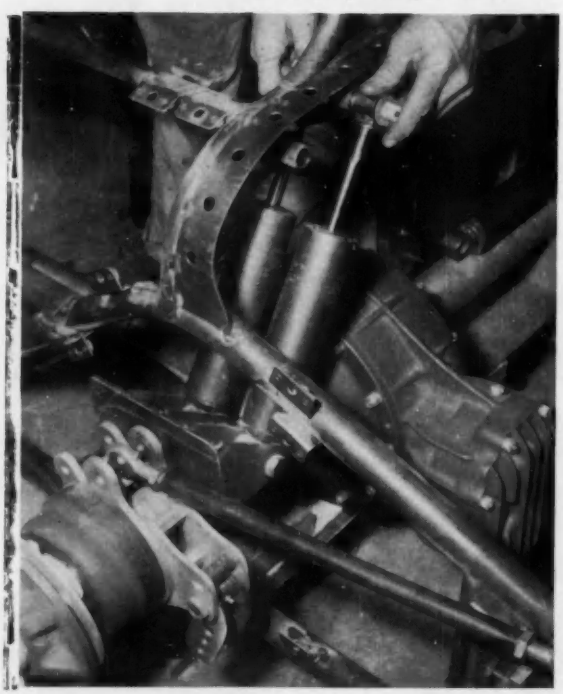
MASERATI AND MERCEDES CARS

Two cars will provide international flavor. One is a 93 cu in. 1953 Grand Prix Maserati entered as the Morgan Engineering Special. The other is the 1939 Don Lee Mercedes which was rebuilt by Eddie Shreve. He replaced the original power plant with a 210 cu-in. Jaguar engine. It's entered as the Safety Auto Glass Special.

TRACK-TESTED TIRES

Firestone, as has been the custom over the years, ran extensive tire tests at Indianapolis during the heat of this past summer. Pat O'Connor, veteran "500" race driver, drove the Firestone special race car more than 2500 test miles. Test speeds ranged from 140 to 146 miles an hour, well beyond what is anticipated for this year's race. One difference in the testing this year was that O'Connor was instructed to abuse tires in every possible way as well as maintain the high average speeds. Within the limits of safety, he braked excessively, accelerated more often and drove the turns out of the groove at higher speeds. As a result of all of this activity, Firestone has a cooler running, better handling, safer tire for the 1957 Memorial Day race; a tire that was developed right on the speedway to provide maximum safety and durability in a year in which we may anticipate record speeds through the turns, which may result in higher average speeds even with this year's somewhat smaller engines.

CHIROPRACTIC SPECIAL *Rear axle and suspension of the Chiropractic Special entered by Dr Sabourin and built by George Shilala*



MAJOR CHANGES COMING in '58 Cars

BY
LEONARD WESTRATE

To the layman, design of an automobile generally means the physical configuration — lines of roofs and fenders, tail fins, curved glass, forward or rearward slanting pillars, height, width and in general what is more properly the styling.

To the engineer, design is something quite different. Styling will be a part of his concept, but many other segments will make up the whole. Suspension, type of power plant and transmission, body construction, location of components in relation to each other, materials used for specific parts, and departures from conventional practice of any nature all influence his evaluation.

Exciting developments in automobile design are in store for the future—just as they always have been. They may, under the stimulus of rigorous competition, come at a more rapid pace than in past years, however. To be first with something new apparently has definite sales value, and right now the heat is on engineering staffs to put steam behind product development.

Some of the new developments for 1958 cars already are general knowledge. Lincoln, for example, will change over to integral body-frame construction for next model year. It will be the only producer, except for American Motors, to use it. Lincoln is in a good position to make the change because it builds all its cars at one plant and is tooling a new assembly unit now at Novi, Mich. Chances of other makers going to unit-frame construction are remote because of the monumental cost of retooling assembly lines, particularly when a large number of branch assembly plants are used.

It also is no secret that suspensions are in for significant changes next year. Air suspension, already in use on the Cadillac Brougham, will appear on all GM lines and possibly on other makes. Air suspension on the front with conventional springing at the rear is under consideration by one company.

A likely guess is that the systems on GM lines will generally follow either the Cadillac principle of air dome and diaphragm or the bellows system. Both feed air from a compressor through leveling valves to maintain constant car height. Other companies may have variations of that system. There is considerable work underway with a sealed system and with one using air from a storage tank which could be replenished at service stations. However, there is no definitive information available on these systems at the moment.

One interesting corollary stemming from coming adoption of air suspension is expanded use of pneumatic power for auxiliary devices, such as window lifts, break boosters, and seat adjusters. GM already has created a special department within its AC Spark Plug division for development work in that area. If an air supply is available, it may well be utilized for many other functions than merely to supply the suspension.

Brakes will continue to get high priority attention from the engineers as acceleration and horsepower increase. So far as is known, no radical departures from the conventional drum and shoe brake are slated for next year's models, but better cooling through fins, bimetal drums, and air deflectors is a possibility. Admittedly there is much interest in disk brakes, but cost still is the big problem. They might possibly appear on the very highest priced cars, but there is no such indication at the present time.

One possibility is an air brake system on a high priced car make next year. It is difficult to see, however, that it could result in any overall braking improvement so long as it is applied to the conventional foundation brakes. It would still be in the nature of a power assist and would have chief value as an innovation.

Horsepower ratings planned for next year naturally are closely guarded this far ahead of new model introduction, but in general they will be higher than for 1957. The performance race has not yet run its course. Larger displacements, higher compression ratios, improved breathing, and other refinements will again push engine output up another notch in 1958. One of the large producers will have an entirely new engine, larger and more powerful than any now in its line.

With one exception, car makers will stay with present automatic transmissions with normal year-to-year improvements. Buick undoubtedly will have its triple-turbine Dynaflow automatic drive, which originally was scheduled for 1957 models but was delayed by tooling problems.

One prediction on 1958 power plants can be made with finality. No company will have a car powered with a gas turbine or free piston engine. There is a great deal of research in progress on both these engines, but they are still years away from production lines.

Currently, the gas turbine appears to have the most promise for truck and passenger car use. The free piston engine has great potential for farm tractors, industrial engines, and other low speed, high torque uses. Biggest obstacle

(*Turn to page* 122, *please*)

Fawick-Girling Brake System for Trucks, Trailers and Buses

NOW that the Fawick Brake Division, Fawick Corp., has moved into its new home on the west side of Cleveland, Ohio, it has embarked on an all-out effort to promote the adoption of the Fawick-Girling brake system on trucks, trailers, and buses. It will be recalled that last year Clark Equipment adopted this type of brake for its new line of trailer axles.

FIG. 1

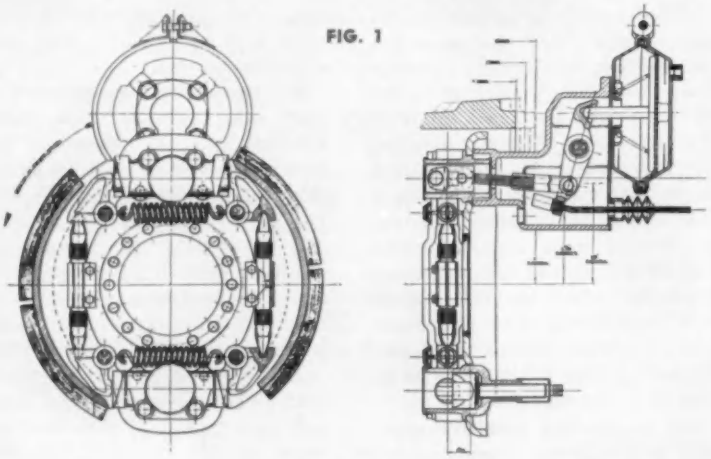


FIG. 2

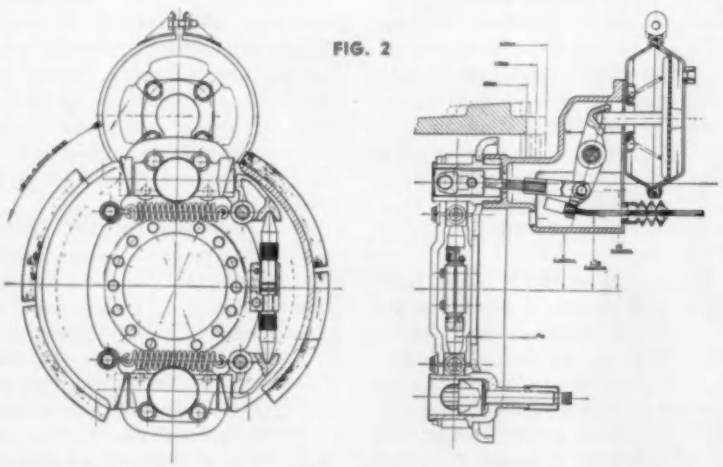


Fig. 1 is a drawing of the Fawick-Girling 2LS/2P brake assembly, showing air actuation. Unique feature is the provision for using the rear brake as an emergency and parking brake as well. Note that for this brake the expander is at the top, with shoe actuation by means of bellcranks at the corners. The adjuster is at the bottom.

Fig. 2 shows the 2LS/1P brake, which is similar to the other except for the fact that the left shoe is trailing in reverse braking.

As illustrated, the brake is available in two distinct types — the 2LS/2P (Fig. 1), and the 2LS/1P (Fig. 2). The first type provides two leading, self-energizing shoes for both forward and reverse; the second, two leading shoes for forward braking; one shoe leading, one shoe trailing, for reverse.

The 2LS/2P brake has two shoes actuated by the expander cylinder at the top, operating through the system of bell-cranks at each corner, the actuation to the heel of each shoe being through the pushrods on each side. Both brake shoes are free-floating and self-centering with a sliding action said to assure full lining contact and compensation for wear. The lower cylinder is the adjuster.

The 2LS/1P is of exactly the same basic design except for the simplification of parts due to the fact that the shoe at the left is of trailing type. Hence this shoe is not fitted with bell-cranks or pushrod. Otherwise the features are all the same.

The new brake system has been developed for simplification both in design and production line application. For example, it aims at one standard axle mounting for front axles; and one standard mounting for rear axles and trailer axles. This makes for complete interchangeability of standard brakes for the entire gamut of axles and vehicles.

Moreover, there is a standard foundation brake for all rear axles, and one for all front axles. Regardless of the type of actuation—hydraulic, air, or vacuum—and regardless of brake shoe width, the foundation is standard and interchangeable. This means

All actuation mechanism is self-contained and interchangeable as to mounting. Fig. 3 shows a hydraulic cylinder for rear brakes, provided with a mechanical link for parking brake operation.

Fig. 4 illustrates the standard hydraulic cylinder for use with front or rear brakes.

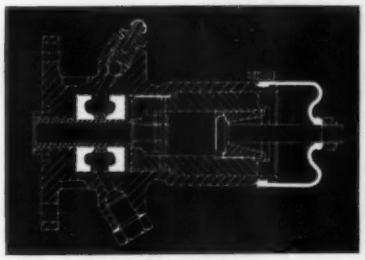


FIG. 3

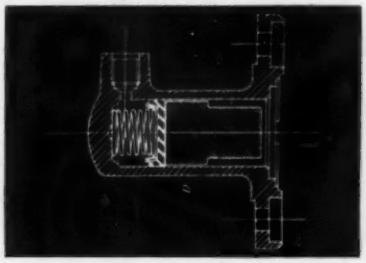


FIG. 4

that on the production line it is feasible to install the standard foundation directly from a common stockpile without being concerned about either brake size or method of actuation specified for the vehicle. Brake shoes of the proper width can then be installed; and the actuation means installed according to specification.

Fawick not only provides its own actuation systems but has so designed these attachments as to be interchangeable on any foundation. Figures 1 and 2 show the air diaphragm that is offered for air actuation. In the case of rear brakes, shown here, there is also provision for emergency hand brake operation, making for an extremey simple installation that can eliminate transmission or propeller shaft emergency and parking brake systems.

The actuation attachment is a standard, interchangeable, self-contained unit which is bolted onto the torque plate. Figure 3 shows the Fawick hydraulic cylinder. This one has a mechanical link for parking brake actuation for rear axle brakes. The point is that any of the three types of actuation can be attached to the standard foundation; and they can be just as readily exchanged or replaced. Figure 4 shows the standard Fawick hydraulic cylinder for front or rear brakes.

It may be noted too that Fawick offers a group of close-coupled arrangements for air diaphragm actuators to take care of various clearances.

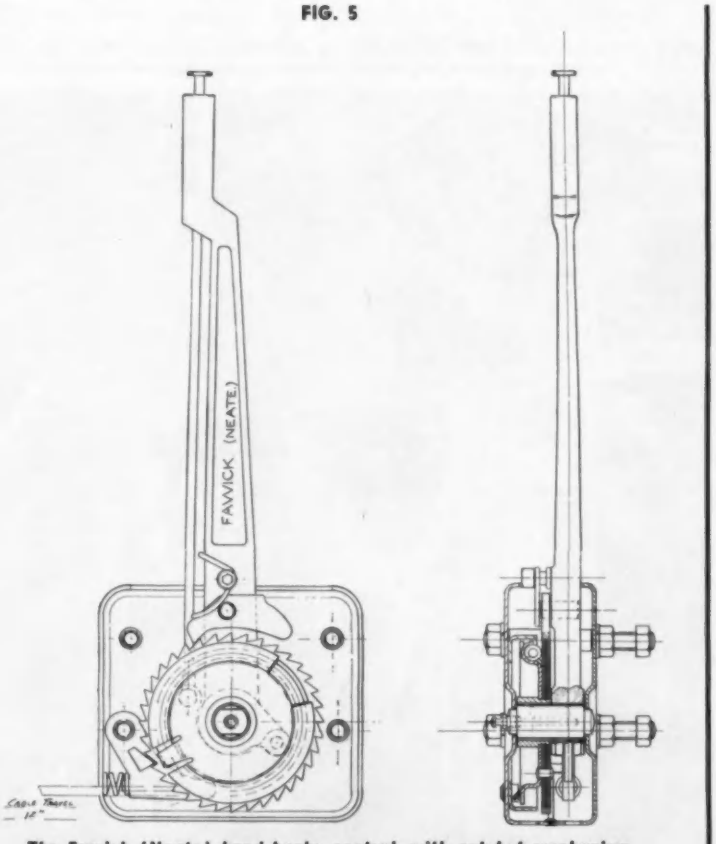
Brake shoes are interchangeable in either cast or fabricated type, fabricated shoes of lightest design being feasible with this system. Linings are the same for both shoes and it is claimed that linings can be used more effectively due to the sliding shoe principle. Standard commercial linings are acceptable, either riveted or bolted.

It is claimed that lining wear is uniform on both shoes. In addition, there is maximum utilization of lining thickness due to the unique type of wear pattern. In essence, it is claimed that more brake applications are possible with a given lining before reline is necessary.

Another advantage claimed by Fawick is that of using lighter brake drums. The 2LS principle is said to result in uniform drum loading because both shoes do equal work. Brake drum distortion is said to be reduced since the shoes are free to slide and can conform better to drum contour. Heat checking also is said to be reduced. The combination of sliding shoes with equal shoe loading results in maximum lining contact, thus reducing high temperature

(*Turn to page* 175, *please*)

FIG. 5



The Fawick (Neate) hand brake control, with ratchet mechanism, for operating the rear brakes as emergency or parking brakes. It has available a cable travel of 12 in. for full on, and quick release.

Newest Automatic Controls

Among Topics at

MACHINE TOOL ELECTRIFICATION FORUM

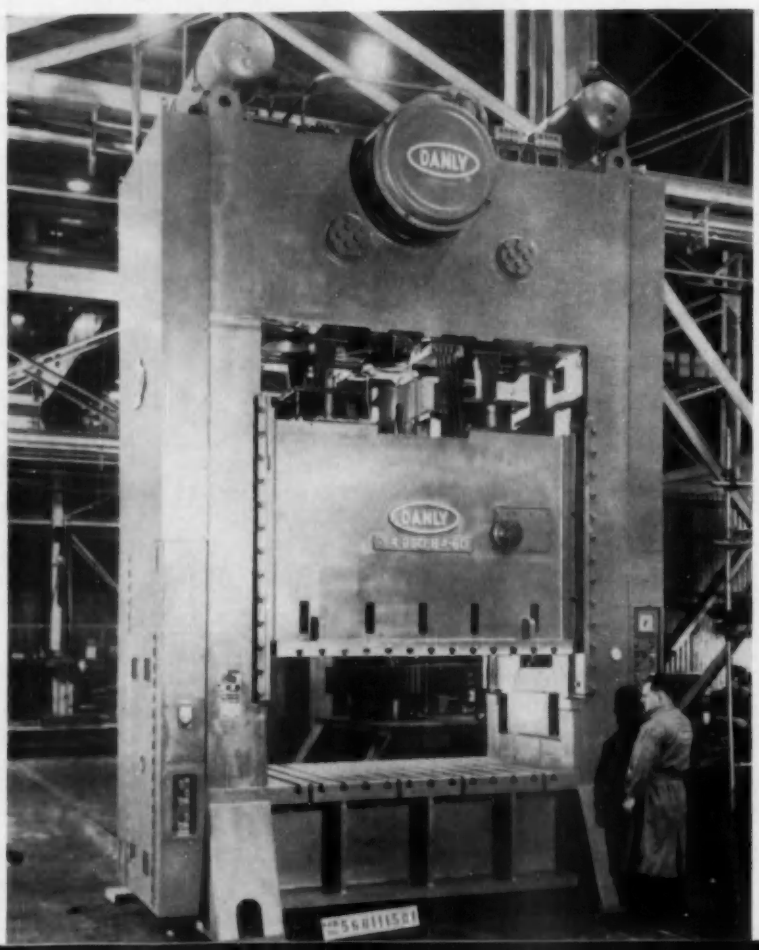
By Charles A. Weinert

CYBERNETICS, the science of control, was very much in evidence at the 21st Annual Machine Tool Electrification Forum. Besides control applications, many associated machine tool aspects, such as automatic gaging, process recording, power supply, reduction of obsolescence, and latest developments in components, were subjects of the well-rounded program. Sponsored by the Westinghouse Electric Corp., the conference for an exchange of ideas on electrical equipment for machine tools was held in Buffalo, N. Y., April 24-25. Attended by more than 500 executives and engineers, the two-day meeting was actively participated in by members of the National Machine Tool Builders' Association.

● Die Positioning

Automatic die positioning by a recently developed static control, facilitating the setting of shut-height on a punch press, was explained by D. T. Kennedy of Danly Machine Specialties, Inc. As viewed by the operator, the control consists of a dial which is turned to the desired shut-height indication, this causing the slide to automatically adjust to the dialed height. In a typical sequence of adjustment the die setup man selects the new shut-height, and once the dial is moved the control is unbalanced and the slide adjustment motor will move to correct the unbalance. When the press is provided with rapid traverse feature, the slide will move at high speed to the new shut-height, if the change is great. If the change is small, the slide will move at low speed so the setup man can closely check the movement.

Danly press equipped with automatic die positioning control which provides a simple and quick means for accurately setting shut-height



The motor used for the rapid slide adjustment is a variable speed d-c unit that is controlled by a three-phase magnetic amplifier using a transistor preamplifier. The entire control is housed within the press upright. It is said that full slide adjustment can be accomplished from extreme top to extreme bottom on the press illustrated in less than 18 sec, as compared with a normal adjustment time of 10 minutes.

Another advantageous application of the control is to presses with very short strokes. For example, a three-inch stroke press is usually difficult to clear in the event of a jam-up. By turning the dial selector switch, it is possible

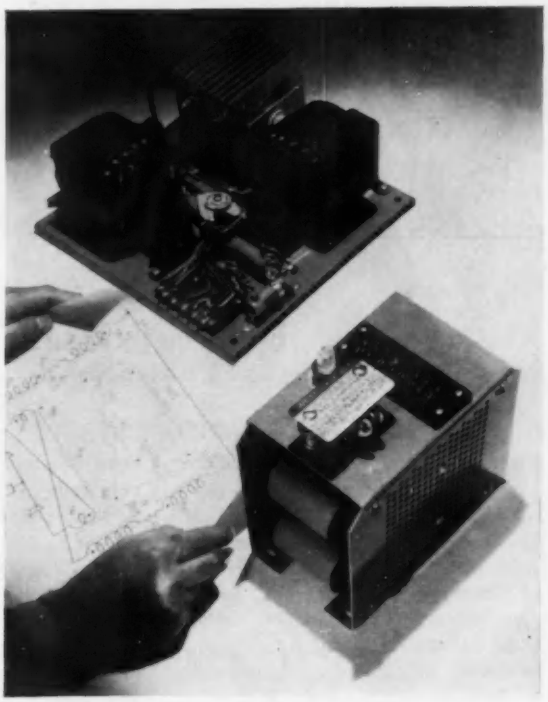
to rapidly retract the press slide 10 in., allowing the operator 13 in. in which to work and clear the die. Afterward it is only necessary to turn the selector to "adjust" for the slide to quickly return to within 0.001 in. of its former shut-height.

● Cypak Developments

The progress and application of Cypak controls since their introduction to industry in 1955 was reviewed by W. B. Weathers and Roy A. Clark, Westinghouse Electric Corp. Developments, generally, have produced more rugged units, improved wiring and component arrangement, standardized functional circuitry, and better accessibility. Mention was made of the recent application of Cypak to an automatic programmed conveyor in the new Chrysler Delaware assembly plant. Installed in March of this year, it automatically controls the routing of automobile bodies from main assembly line into and out of selected conveyors in a storage bank. This is the first construction of Cypak in a control center type of cabinet; and over 6000 logic elements are used in the synchronized conveyor operation system.

In 1955, as a complement to logic elements, Westinghouse announced a line of output magnetic amplifiers. The first amplifiers were designed around a contactor load which had inrush current equal to about five times holding current. Doubler-type magnetic output amplifiers met this 5:1 current requirement adequately. However, as experience was gained it became evident that these amplifiers were insufficient for meeting the requirements of hydraulic or pneumatic solenoid devices, whose short duration open-gap inrush current is normally five to ten times the steady-state excitation of minimum magnetic gap.

In the design of a new amplifier, the following characteristics were considered essential: output voltage to be 95 to 100 per cent of nominal voltage for a 10:1 load current range; output must not interfere with self-regulated armature velocity; response should be less than six cycles, including electro-magnetic device; and ±10 per cent line voltage variation should not be magnified, but reduced. The resulting unit is termed a load-controlled magnetic output amplifier, which comprises two main saturable magnetic cores and two auxiliary saturable magnetic coils. The new line will soon be available for use with Cypak systems, and the amplifiers will be offered with inrush ratings of 2, 3, 4, 6 and 8 amp, and with holding ratings as low as one-tenth of the inrush current capacities. A further feature of the new amplifiers is a load safety fuse which will protect the electro-magnetic device from sustained inrush currents if the device should become "hung up." The new units also show a panel space saving over the old output magnetic amplifiers of about 67 per cent, as indicated in the accompanying illustration, besides providing about a 200 per cent increase in inrush capacity.



Westinghouse load - controlled output amplifier (foreground), contrasted with the earlier doubler type. The new design shows a panel saving of 74 sq in. (about 67 per cent) with about a 200 per cent increase in inrush capacity.

Another engineering development has resulted from the fact that in many applications it is necessary to transmit and store a great deal of information serially in a group of in-line stations. An application in which this type of function can be useful is in warehousing, where a large number of randomly-mixed products are to be sorted and dispatched to different storage or loading locations. Among other applications is in automatic testing according to a preprogrammed pattern established by punched cards or tape, or to a pattern set up manually by an operator. In such applications the function of a shift register could be performed by a system of current Cypak elements. The new development, however, consists of a special shift register element which reduces the total number of elements needed per station, for receiving, storing and transmitting the desired information. An additional feature of the shift register is the availability of readout of information at any intermediate station along the shift register line.

A paper presented by George H. Royer, Westinghouse Electric Corp., revealed that transistors as applied to control systems are being investigated and gave the results of experimental work with a transistor NOR circuit. While emphasis was placed upon the fact that the circuits are still experi-

(*Turn to page* 168, *please*)

Lead and Zinc Processors Hold Meetings in Chicago

By Kenneth Rose

THE use of still more lead in storage batteries was predicted at the 29th Annual Meeting of the Lead Industries Association which began April 24 at Chicago. B. B. Steiner, president of the Association of American Battery Manufacturers, Inc., said that 387,000 tons of lead will be used in storage batteries during 1957. This is based upon an estimated production of 34,983,000 automotive type storage batteries, with 35,000 tons of lead going for industrial type batteries. Last year 366,000 tons of lead were used for storage batteries. The estimated increase in the number of automotive storage batteries is a little more than two million over last year.

Average life of automobile batteries has been as low as 16.3 months, and as long as 27.6 months since 1940, he said. The longest average life was recorded last year. Average automobile battery weight is 20.11 lb, and the change from 6-volt systems to 12-volt has brought about an increase in weight. All new passenger cars except the Willys Jeep, he said, are now equipped with 12-volt systems. Total registration of cars shows the 12-volt system increasing from 0.7 per cent in 1953 to 9.2 per cent last year.

During the meeting, Andrew Fletcher, president, St. Joseph Lead Co., was reelected president and chairman of the board of directors of the Lead Industries Association. Kenneth C. Brownell, president of the American Smelting & Refining Co.; Joseph A. Martino, president of the National Lead Co., and Miles M. Zoller, vice president of The Eagle-Picher Co., were reelected vice-presidents. Robert L. Ziegfeld continues as secretary-treasurer.

Two new directors were elected to fill vacancies on the board. They are William P. Wilke, III, vice-president, Hammond Lead Products Inc., Hammond, Ind., and Reuben Viener, of Hyman Viener & Sons, Richmond, Va. Directors reelected are J. D. Bradley, president, The Bunker Hill Co.; J. A. Costello, vice-president, Ethyl Corp.; W. H. H. Cranmer, president, New Park Mining Co.; H. L. Day, president, Day Mines, Inc., Clarence Glass, vice - president, Anaconda Sales Co.; K. W. Green, purchasing agent, Electric Storage Battery Co.; F. S. Mulock, president, United States Smelting Refining & Mining Co.; Jean Vuillequez, vice-president, The American Metal Co., Ltd., and Frederick Walker, vice-president, Federated Metals Division of American Smelting & Refining Co.

The executive committee, composed of Andrew Fletcher, chairman, J. D. Bradley, K. C. Brownell, J. A. Costello, J. A. Martino and F. S. Mulock, was reappointed.

American Zinc Institute Meeting

Something of what zinc faces in the automotive market was outlined for members of the American Zinc Institute by Joseph Gurski, assistant manager, Process Development Department in Manufacturing Engineering for Ford Motor Co., at the annual meeting of the Institute which opened with a joint session together with the Lead Industries Association on April 25 and continued through the 26th.

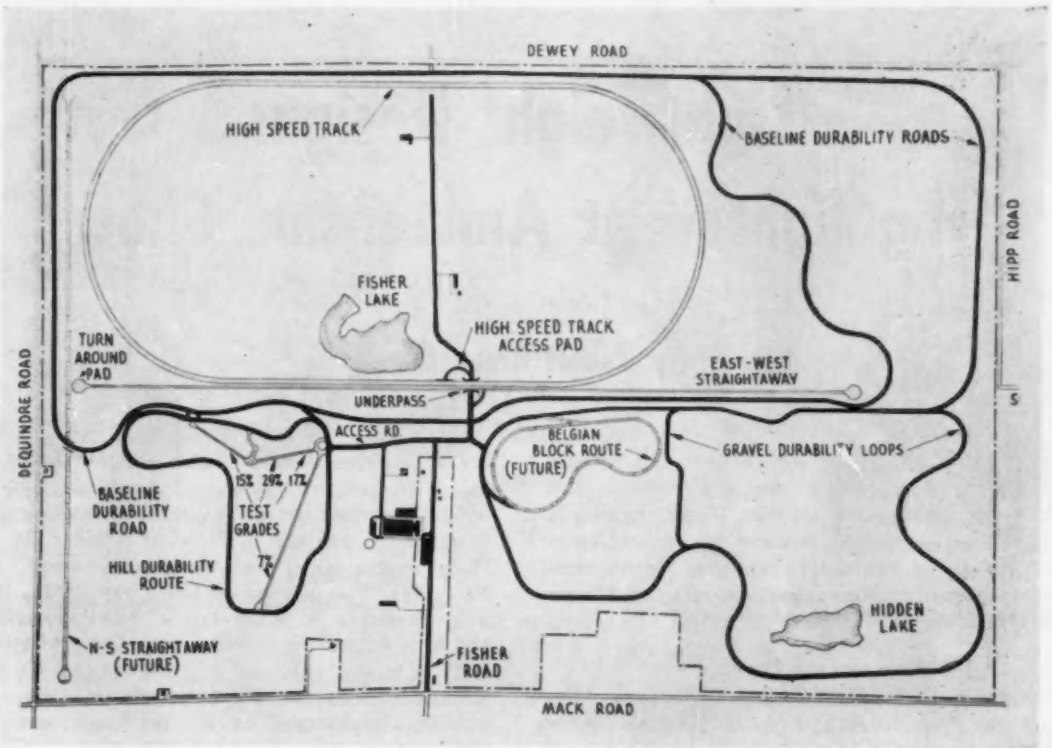
According to Mr. Gurski, the most important uses for zinc in the automobile industry are in electroplating, in die castings, and in brass. Electroplated zinc coatings on small parts such as nuts and bolts do an excellent job, and the use of zinc here seems to be secure. Zinc die castings are facing a serious quality problem in bright plating. Brass, with zinc as an alloying metal, is likely to be supplanted in certain of its applications. "There is a growing serious concern about the quality of bright plated zinc die cast parts. This concern is so great that it is accelerating the trend to other methods of finishing." In some parts of the country, he said, plated die castings will not withstand corrosive atmospheres and salt used for winter ice and snow removal.

Regardless of the plating problem, plated zinc parts will be displaced where special styling effects call for the colors available in colored anodized aluminum, or for multicolor effects or translucence available in plastics. Development work upon anodizing of aluminum die castings, if successful, would have great impact upon present materials.

Functional zinc die castings show somewhat higher cost per unit volume, and a tendency to creep as compared to aluminum. Here the highly developed and widespread facilities of the industry, however, assure adequate supply as an advantage for zinc.

Brass goes into automobiles in radiators, heaters, small instruments, gages, carburetor floats, wire terminals, screens, and some machined parts. During periods of copper shortage, and consequently high priced brass, the industry has been exploring the possibilities of other materials. It appears possible that brass used in radiator tanks will be replaced by rustless steel. If aluminum fins as a replacement for copper fins should be worked out successfully, zinc usage would be increased by the change

(*Turn to page* 126, *please*)



All Types of Roads Provided at Ford's New Proving Ground

COMPLETION of the new Michigan Proving Ground near Romeo gives Ford Motor Co. a total of 8080 acres for road testing of cars, trucks and other vehicles.

A record 4 million cu yds of earth were moved in the 3880-acre test area between July, 1955, and the end of 1956 when contracting work was completed.

The operation required use of more than 100 major pieces of equipment, including bulldozers, bottom dump trucks, scrapers, draglines, sheepsfoot rollers and 50-ton compacting machines.

Foremost test course at the proving ground is the high-speed track — a five-mile, reinforced concrete oval five lanes wide and banked so steeply that in its curves the outer edge of the pavement is 11½ ft higher than the inner. It is designed for neutral speeds of 140 mph without any feeling of side thrust on the curves, and up to 180 mph on the turns.

Adjacent to the high-speed track is a 2½-mile straightaway for checking acceleration and braking performance. It is a completely flat, 36-ft-wide concrete strip with paved turnaround pads, 200 ft in diameter, at each end. It was built to coincide at every point with the curvature of the earth so that the force of gravity is equal along its entire length. This permits highest accuracy in all tests.

One of the chief reasons for building this new proving ground was to provide a network of good, medium and bad roads for routine 20,000 to 60,000-mile car-endurance tests. Unlike the public roads used previously for these tests, they will remain exactly the same year after year so that precise car-performance comparisons always can be made.

The first, a basic durability route, is 7.2 miles long. Here are dips and sharp curves. Bumps are built into the paved surface to resemble the road hazards commonly encountered by the motoring public.

It is supplemented by a hill durability route to test pulling power. This route is a black-topped loop, 2.3 miles long. It has sharp turns and includes a variety of test grades up to 25 per cent.

The gravel durability route provides 8.1 miles of rough, winding road over rolling terrain with grades up to nine per cent. All three of the durability routes are 22 ft wide.

The proving ground also includes a group of short test grades, ranging from seven per cent to 60 per cent and totaling about one mile in length. These are used for special climb tests. The 60 per cent grade, too steep for passenger cars, is a testing mill for new experimental military vehicles under development by Ford Engineering Staff.

Lightweight Designs Highlighted at Amsterdam Show

By Robert Braunschweig

HOLLAND'S commercial vehicle show this Spring, held in Amsterdam, featured medium and heavy trucks equipped with Diesel engines. A new tax on vehicle weight, however has created enormous interest in lightweight designs for all commercial vehicle types and, particularly, for Diesel-engined vehicles.

Aluminum and Plastic

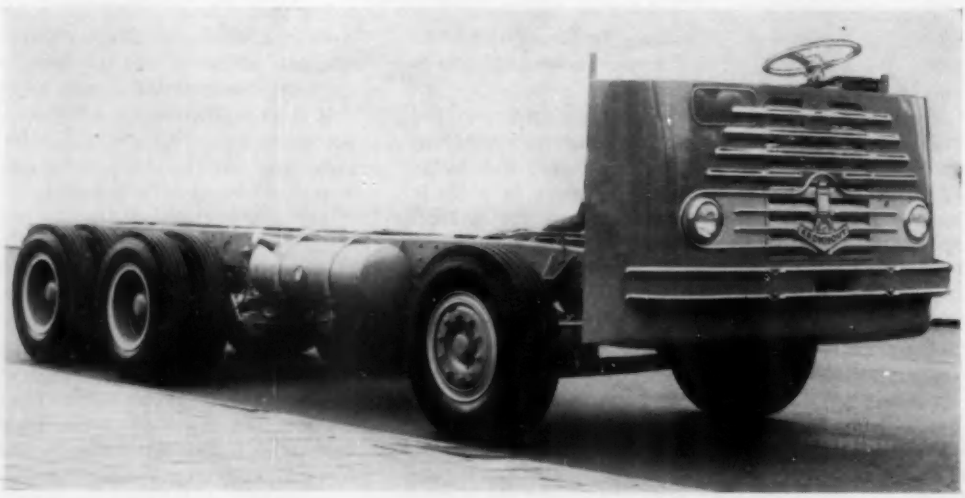
Several Dutch firms have developed aluminum bodies using prefabricated parts and profiles produced by the Aluminum Works at Utrecht, or under French or German patents. Despite higher manufacturing costs, the savings in road taxes and maintenance are sufficient to make light alloy bodies commercially feasible. Although plastic bodies would appear to be just as attractive as aluminum bodies, only a few models were shown at the Amsterdam exhibition.

One of the highlights of the Amsterdam show was a completely new line of commercial vehicles displayed by Bedford (Vauxhall), the British subsidiary of General Motors. This exhibit included 20 truck models on 17 different chassis, with payloads ranging from one to 10 tons. Gross vehicle weights range from 2¼ to 10 tons, with tractors for articulated vehicles up to 14½ tons gross weight. For several models, Vauxhall has introduced a new six-cylinder 300 cu in. Diesel engine, which replaces the proprietary Perkins P6 engine. The new engine has a bore of 3⅞ in. and a stroke of 4¼ in. It develops 97 hp at 2800 rpm and 217 lb-ft of torque at 1400 rpm. Compression ratio is 17 to 1.

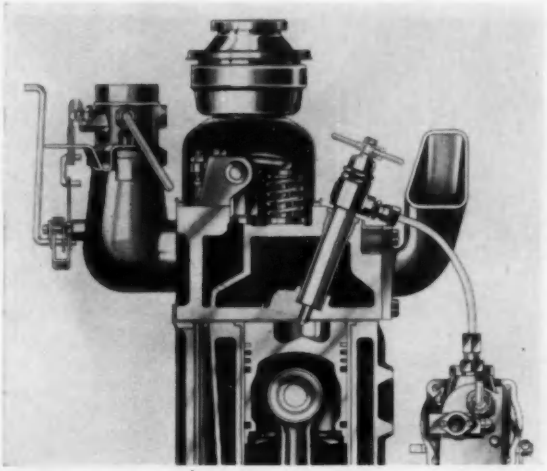
An oil pump for the optionally available power steering is mounted on the machined face of the timing gear case. Bearings are steel steel-backed, copper-lead shells with indium flash. A machined recess in the top of the pistons forms a toroid combustion chamber.

A new four-pinion differential replaces the three-pinion type in all Bedfords having a capacity of four tons of more. Direct-acting shock absorbers are used on all four wheels on the lighter models, but are optional on the rear wheels of medium and heavy models.

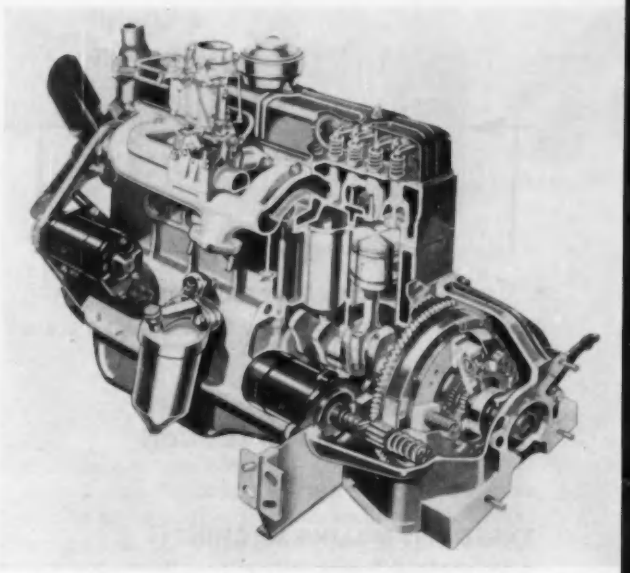
Among the 16 models of tandem axle trucks displayed at the show was the local Kromhout three-axle chassis with a GVW of 51,000 lb. Also shown



Dutch Kromhout 4x6 chassis with tandem axle is powered by a Rolls-Royce 200 hp engine and equipped with power steering



New 300-cu-in. Bedford Diesel engine has offset, torus-shaped combustion chamber located in the crown of the piston



Bedford gasoline engine is similar in design to the Bedford Diesel and has 300-cu-in. piston displacement

was the Swedish Volvo 2½ ton truck, which has forward control and a V-8, 220-cu-in. gasoline engine that develops 120 hp at 4000 rpm. Forward control bodies also were introduced by Scania Vabis and Faun. The latter has adopted the former Oster-Rex two-ton van with the Ford Taunus engine.

The Dutch firm of Zwalve introduced a lightweight trailer which it is building for the Netherlands Post Office system. The trailer has four independently sprung wheels and torsion bar suspension. In order to comply with some of the more complicated regulations governing maximum loads, some Dutch semi-trailer manufacturers are using sliding tandem axle sets, which allow operators to carry maximum loads even when they are transporting bulky materials.

Faun Rex equipped with Ford Taunus engine is the first lightweight truck to be manufactured by the German firm, well known for its heavy commercial vehicles

Bedford 6-ton truck with forward control is available with either 132 or 156 in. wheelbase and with Diesel or gasoline engine

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

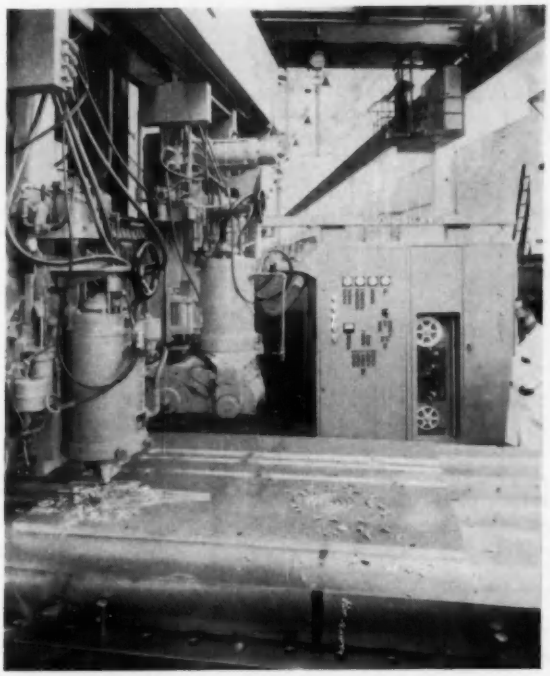
PRODUCTION—VEHICLES—AIRCRAFT

By Samuel Cummings

THREE-AXIS MILLING MACHINE

In previous issues, this column has noted work in progress at Bendix Aviation Corp. on a design model of a numerically controlled, three-axis milling machine. Now, we are able to report that the first production model of this system has been built to specifications for the Martin Co., by the Research Laboratories Div. of Bendix. The model is illustrated below.

The new system, which was demonstrated recently at a press conference in Detroit, was described by officials of both companies as the first practical application of a punched tape control system to a large profile milling machine capable of turning out, for example, a whole aircraft wing section. Martin will install the new machine at its Baltimore division, where it will produce finished, precision-built structural parts for the TM-61 Matador tactical missile and the P6M Seamaster four-jet seaplane.



A numerically prepared magnetic program tape completely controls the operation of this spar and skin milling machine. Known as the Giddings & Lewis Numericord System of Machine Tool Automation, this device is capable of simultaneously controlling as many as 5 machine axes in 3 dimensions and up to 2 auxiliary machine functions. Audio commands can also be included on the magnetic tape to alert the machine attendant to tool change and inspection "stops" planned into the magnetic tape's machining program.

From the console shown here, one man can monitor the operation of 50-ton Kearney & Trecker milling machine. Punched tapes for the Bendix electronic control system can be produced within hours and shipped to plants with electronically controlled milling machines, greatly speeding up the manufacturing operation from blueprint to final production phase.

The machine tool part of the system was built by Kearney & Trecker, of Milwaukee. It uses Bendix high-performance servos that are said to exceed the performance of similar mechanisms on many missiles. The three cutting motions of the machine are continuously monitored by feedback devices capable of detecting movements as small as 0.0002 in.

Even when operated manually, sensitive control of positioning and machine feeds is achieved by means of dials and pushbuttons instead of the usual handwheels. Built-in precision gaging permits worn tools to be replaced without loss of accuracy between cutter and workpiece.

The plastic punched tape that controls the new system may be the answer to the cost problems of small and medium-sized industries, according to Murray Kanes, head of the electro-mechanical department at Bendix Research laboratories. "Instead of intricate

(*Turn to page* 124, *please*)

Vickers Holds Turbojet Engine Hydraulic Symposium

By Joseph Geschelin

TURBOJETS and guided missiles, future trends in hydraulic systems and their accessories, current developments in aircraft hydraulic fluids, and related subjects were on the agenda of the 1957 Turbojet Engine Hydraulic Symposium held in Detroit in April by Vickers Inc. This broad range of topics drew a large attendance of engineers and representatives of manufacturers of powerplants, test equipment, airframes, and fluids, as well as representatives of domestic and foreign airlines.

Although nuclear powerplants for military airplanes were not mentioned directly, from the discussion at various points it was obvious that much of the new development was pointed to this type of power. For one thing, hydraulic control systems are expected to be more complicated; and it was noted that the design of accessory items took into account the effects of a radiation environment.

The consensus of a panel on recent trends and developments in propulsion systems appeared to be that in the near future the military establishment would be budgeting more for missiles and ICBM than for jet engines and piloted aircraft. The guesses wer that a cross-over point in budgeting might be in view in the next two years. If that occurs the emphasis on jet engines of various types and sizes would be concentrated more on commercial airline applications.

As a matter of fact everyone concerned with propulsion system development and missile development is pointing research programs to the apparent needs of the future. Just along this line Dr. G. Reethof, Vickers chief of research, presented a paper looking into the future of fluid power controls, visualizing the need for control systems capable of operating in an environment of 700 F and higher.

One of the major problems with the use of hydraulic fluids under such elevated temperatures is the loss of lubricity and the consequent need for providing adequate lubricity in some other manner. One avenue being investigated is the use of gases. Dr. Reethof showed that high pressure, high temperature gases can be employed with performance comparing favorably with best fluid practice. The generation of high pneumatic pressures can be accomplished by either solid or liquid propellent gas generators.

Coming to liquids, Dr Reethof explored the possibility of employing hydrokinetic machines with mercury as the fluid. Mercury in liquid form is thermally stable up to 660 F when it oxidizes to form a rather unstable mercuric oxide. However, this decomposes at higher temperatures into Mercury and free oxygen. Its viscosity at 650 F is of the same order as aircraft type oils at 600 F. Further exploratory work is under way with various types of fluids, including special hydraulic fluids.

Should engine hydraulic systems be integrated with the engine lube system? Or is it better to have an independent hydraulic system? Pros and cons of this knotty question were covered by R. P. Mac Donald and D. E. Uehling, jet engine department, General Electric Co. The authors felt that under present environmental conditions they prefer to employ an integrated system. It is more compact, lighter, has less plumbing, and is less expensive. The separate system, on the other hand, appears to offer the possibility of improved reliability and performance, allows the designer more flexibility in planning the system, and tends to reduce the hydraulic system heat load.

Nevertheless, the authors are inclined to favor the independent hydraulic system only for future advanced designs when flight speeds become higher and are accompanied by exponential increases in temperatures. It may be noted that these conclusions were not supported by some of the discussors.

A new type of exhaust nozzle hydraulic control system has been introduced by Vickers for small turbojet engines. A load-sensitive system, it is designed for small engines where size and weight are paramount. The system combines the advantages of both the servo pump and servo valve and takes advantage of varying engine load characteristics. Extremely flexibile in concept, the system can be constructed in a single package or employed in individual components. Since the circuitry is extremely simple, reliability is said to be of a high order.

One of the bright spots of the meeting was a brief presentation of some of the features of the Rolls-Royce Conway jet engine which was described at the recent SAE Aeronautical Meeting in New York. According to K. I. C. Vincent, American representative for Rolls-Royce, the Conway engine has been accepted as an optional powerplant for the DC-8 and the Boeing 707 for commercial airlines use. It is likely that this engine will be specified by British and other foreign airlines for airliners built to their order.

Vickers also presented some comprehensive reports dealing with new developments in hydraulic components. Research emphasis has been impressed on design details concerned with improved reliability: higher operating pressures—up to 4000 psi; higher

(*Turn to page* 118, *please*)

PREVIEW of the DESIGN ENGINEERING SHOW

ABOUT 20,000 visitors are expected to attend the second Design Engineering Show, which will be held in the New York Coliseum from May 20 to 23. The first show, staged in Philadelphia last spring, attracted 12,800 visitors.

In conjunction with the show, the Machine Design Division of the American Society of Mechanical Engineers is sponsoring a three-day conference (May 20-22) on the latest techniques and materials in the design engineering field.

The show will occupy three floors of the Coliseum, or approximately 90,000 sq ft of exhibit space. About 375 of the nation's leading manufacturers will display components which go into the making of end products. These include mechanical, electrical, hydraulic, and pneumatic devices; metallic and non-metallic materials; fasteners; finishes and coatings; shapes and forms; and accessories to product development. In addition to new products ready for the market, some firms will display experimental materials and devices.

For the design engineer, the machine design division of A.S.M.E. has scheduled seven technical sessions, which will feature papers by outstanding men in the design field. A panel discussion, "Procedures in Developing New Designs," will occupy the entire first day of the conference. On the next two days, the conference will be divided into two mechanical, two materials, and two electrical sessions.

In the materials sessions, speakers will discuss metals and alloys for high-temperature use, new applications for ceramic materials, use of plastics to replace standard construction materials, and new types of coatings and plastics.

The electrical sessions will cover the economic feasibility of using numerical control on various machines, design of machine tools for automatic control, electric motors, and functions of static switching devices.

Mechanical sessions will deal with cams, gears, hopper feeding devices, and the methods of designing parts that can be easily machined, handled, and assembled during the production process.

The ASME annual banquet will be held at the Hotel Sheraton Astor, on May 23. William F. Ryan, ASME President, and vice-president and senior consulting engineer, Stone & Webster Engineering Corp., will deliver the principal address.

CONFERENCE PROGRAM

MONDAY, MAY 20, 10 AM

PROCEDURES IN DEVELOPING NEW DESIGNS

A question-and-answer panel session with questions from the floor. Chairman and Moderator—George F. Nordenholt, Editor, Product Engineering, New York. Vice Chairman—Charles Marks, Member, New York and Patent Bar, New York.

Panel Members—T. M. Butler, Director of Engineering, Burroughs Corp., Detroit; Myron S. Curtis, Engineering Vice-President, Warner & Swasey Co., Cleveland; George F. Habach, Vice-President, Engineering, Worthington Corp., Harrison, N. J., Robert H. Hose, Partner, Henry Dreyfus Associates, New York; William J. Russell, Vice-President, Engineering, Landers, Frary & Clark, New Britain, Conn., and Walter Dorwin Teague, Walter Dorwin Associates, New York.

TUESDAY, MAY 21, 9:30 AM

THREE CONCURRENT SESSIONS

MECHANICAL SESSION Chairman—Colin Carmichael, Editor, Machine Design, Cleveland. Vice-Chairman—Robert M. Conklin, Assistant Manager, Mechanical Engineering Department, Battelle Memorial Institute, Columbus, Ohio.

NEW DEVELOPMENTS IN DESIGN AND APPLICATION OF GEARING

Darle W. Dudley, Advanced Design Engineer, Gear Engineering, General Electric Co., West Lynn, Mass.

NEW DEVELOPMENTS IN DESIGN AND APPLICATIONS OF CAMS

Harold A. Rothbart, Professor, Department of Mechanical Engineering, College of City of New York, New York.

MATERIALS SESSION Chairman—Henry R. Clauser, Editor, Materials and Methods, New York. Vice-Chairman—Joseph Bonanno, Chief Engineer, Lionel Corp., Irvington, N. J.

METALLIC MATERIALS

C. R. Simcoe, Principal Metallurgical Engineer, Battelle Memorial Institute, Columbus, Ohio.

CERAMICS AND REFRACTORY MATERIALS

John H. Koenig, Director, and Edward J. Smoke, Professor, School of Ceramics, Rutgers University, New Brunswick, N. J.

ELECTRICAL SESSION Chairman—Frank J. Oliver, Editor, Electrical Manufacturing, New York. Vice-Chairman—Walter T. Buhl, Vice-President, Engineering and Manufacturing, Leland Electric Co. Division, American Machine & Foundry Co., Dayton, Ohio.

SELECTING MOTORS WITH NEW NEMA FRAME SIZES

Earl Barnes, Assistant Chief Engineer, Reliance Electric & Engineering Co., Cleveland.

STATIC SWITCHING DEVICES

Dr. Robert A. Mathias, Assistant Professor, Department of Electrical Engineering, Carnegie Institute of Technology, Pittsburgh.

(*Turn to page* 154, *please*)

1957 DESIGN ENGINEERING SHOW

New York Coliseum
May 20-23

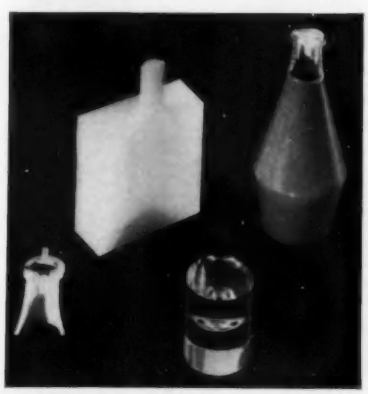
FOR ADDITIONAL INFORMATION
please use reply card on PAGE 89

Plastic Welding

New developments in spin-welding, a process for fabricating thermoplastic parts, will be demonstrated in one exhibit. The process utilizes frictional heat, generated by the rotational rubbing of two surfaces, to melt and join them together.

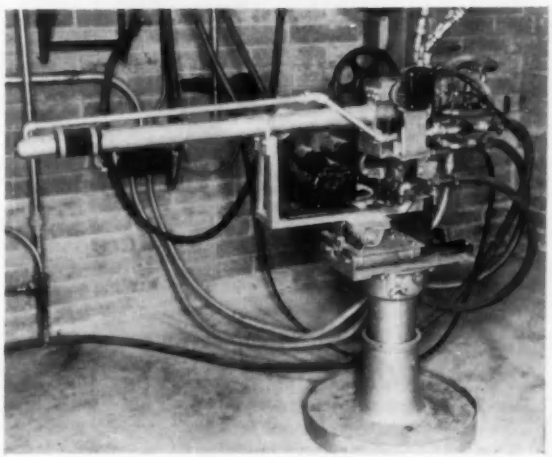
In the case of Zytel nylon resin, for example, product parts may be spin-welded into place to obtain multi-color effects. Slabs of Zytel may be joined by spin-doweling, producing surfaces so intimate that the composite may be machined as a solid unit. Production time on large shapes may thus be reduced significantly by fusing thin sections which require comparatively short molding cycles. Spin-welding is useful also in joining two sections of Lucite acrylic resin. Of special interest is the fact that the proces can be applied to embed fairly flat objects in Lucite. Bonds produced by spin-welding are said to have the strength and clarity of the parent materials.

Also to be displayed are new applications of Alathon polyetheyene resin, Zytel, Tynex nylon monofilament, and Teflon. A second demonstration will be based on a pump with components of Teflon. *E. I. du Pont de Nemours & Co., Inc., Booths 1014-1022.*



Plastic parts joined by spin-welding

Circle 30 on postcard for more data



Linde flame - plating gun consists of a barrel and a mechanism for loading precise quantities of coating powder, oxygen and acetylene into the firing chamber. It is aimed and fired by remote control from a central board outside the firing station

Flame-Plating Process To Be Featured

Controlled detonation is said to be the key to a unique flame-plating process that will be featured in one exhibit and demonstrated by means of a scale model of the flame-plating detonation gun, as well as by a continuous sound track. Its purpose is to apply thin coatings of tungsten carbide or aluminum oxide to virtually any base metal, for wear resistance and, in the case of aluminum oxide, wear resistance combined with resistance to high temperature deterioration. Coating thicknesses can be from 0.002 to 0.010 in.

The specially-constructed gun literally blasts particles of the coating material onto the surface of the workpiece. These are fed into the chamber of the gun and are suspended in a mixture of oxygen and acetylene. When this mixture is ignited, a detonation takes place. The detonation wave travels at 10 times the speed of sound through the barrel, heating the particles to plasticity, and imparting a supersonic velocity to them. The particles are hurled out of the barrel and embed themselves in the surface of the workpiece where a microscopic welding action takes place producing a tenacious bond at the interface. Although the temperature of the gases inside the gun barrel reach 6000 F, the temperature of the part being plated seldom exceeds 400 F, thus allowing the base metal to retain its metallurgical properties. Successive detonations build up the coating material to the desired thickness. *Linde Air Products Co., Booths 1005-1023.*

Circle 31 on postcard for more data

Silicone Applications

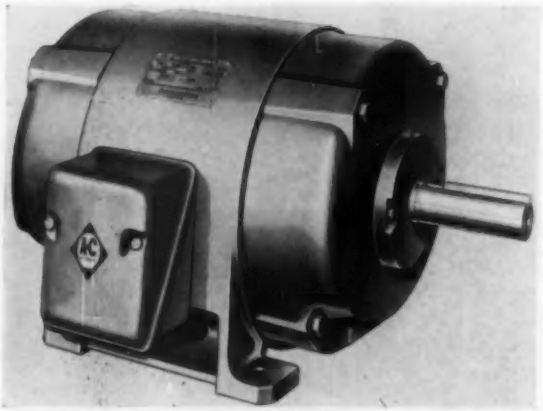
Products and aplications of silicone will be exhibited, including engineering demonstrations. New silicone products shown will include: Molding compounds that can be easily fabricated to produce light-weight structural components that withstand temperatures up to 700 F. Fluorosilicone rubber that is exceptionally resistant to oils, chemicals and jet engine fuel. A special feature will be the first public showing of Silastic Type K, a silicone rubber interlayer for safety glass windshields in supersonic aircraft. *Dow Corning Corp., Booth 406.*

Circle 32 on postcard for more data

1957 DESIGN ENGINEERING SHOW

New York Coliseum
May 20-23

FOR ADDITIONAL INFORMATION
please use reply card on PAGE 89



Allis-Chalmers Synduction motor, one of several products in an exhibit, combines synchronous speed with simplicity of induction design

Electrical Products and Drive Components

One feature of a display will be a 1½-hp, 1800-rpm Synduction motor with an audience participation setup for demonstrating its constant synchronous speed from no load to pull-out regardless of load.

Other products to be shown in this booth include: Flange-mounted flat-type motors designed for compactness to conserve space. An operating package drive power unit for variable speed control through the use of a d-c adjustable voltage system. An underwater high potential testing display of Silco-Flex insulating system for form-wound motor and generator stator coils. Magi-Key sheaves for quick and easy speed adjustment of V-belt drives. And rotary switches (Type 210) for operating instruments and for controlling electrical equipment. *Allis-Chalmers Manufacturing Co., Booth 1730.*

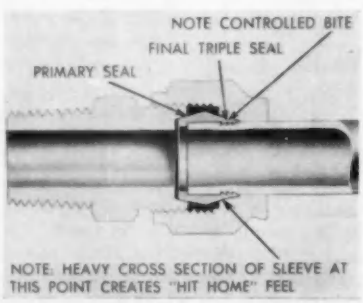
Circle 33 on postcard for more data

Tube Fittings

Hi-Seal a new type of flareless tube fitting will be one of the new products featured in an exhibit of 17 types of tube fittings. It is designed for a full range of pressure conditions and is said to be especially suited for hydraulic applications. Furnished in steel and stainless steel, a feature of its design is that due to the butt-joint formed, with no tube entry into the body of the fitting, it is unnecessary to spring the tube in making assemblies. This is considered important when working with large size, heavy wall or hard temper tubing or short lengths of tubing, which are difficult or impossible to spring. No flaring or welding is required.

As part of the exhibit there will be demonstrations of the Hi-Seal and other fittings under pressure conditions. Tubing assemblies will be made up and subjected to hydraulic pressures sufficient to burst the tube. *Imperial Brass Mfg. Co., Booth 944.*

Circle 34 on postcard for more data


NOTE CONTROLLED BITE
FINAL TRIPLE SEAL
PRIMARY SEAL
NOTE: HEAVY CROSS SECTION OF SLEEVE AT THIS POINT CREATES "HIT HOME" FEEL

Imperial Hi-Seal fitting assembly

Blind Rivets

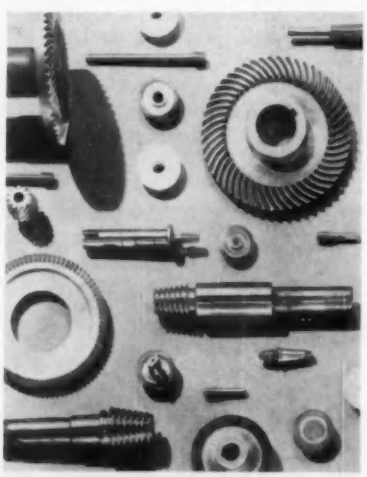
A demonstration unit will be set up in one booth to show Pop rivets in process of application. The unit will consist of pre-punched aluminum sheets, mirrored to show the blind or inaccessible side of the panel. Visitors will be invited to set the rivets with a light-weight hand gun whose retracting jaws pull the mandrels of the hollow rivets to form a large head on the blind side of the work.

New items which will be displayed include a 3/32-in. OD Pop rivet for electronic and nut-plate applications, and anodized aluminum rivets. The latter are available in a range of decorative colors to match the finish of product materials. *United Shoe Machinery Corp., Booth 1839.*

Circle 35 on postcard for more data

Skew-Axis Gears

Gears of a unique design, utilizing a face-type gear and conical worm for power reductions and applicable to an infinite number of product drives, will be among the featured displays in an exhibit. Designated Spiroid, the design principle is a recent addition to the family of skew-axis gears which includes worm gears. It is said to give



Illinois Tool Works Spiroid gearing

three to four times more tooth contact than other skew-axis gears, and added power transmission capacity per pound of weight or inch of diameter. Resulting advantages include space and weight savings. The gears have been made in sizes from ¾ to 52-in. diam, and are available in ratios from 9:1 to 300:1 and over. *Illinois Tool Works, Booths 1822, 1824.*

Circle 36 on postcard for more data

High-Strength Steels

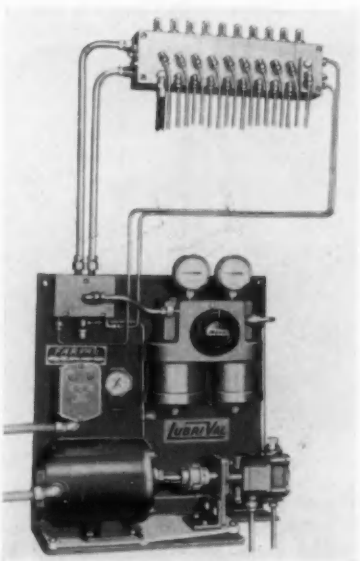
In one exhibit there will be a comprehensive display of a variety of steel alloys and products. Among these will be T-1 steel, a new engineering material which is said to have three times the yield strength of ordinary steel; to be readily weldable without preheating or stress relieving; to have unusual toughness at sub-zero temperatures; and to have outstanding resistance to impact and abrasion. Of special interest to aircraft designers will be the new stainless steels Tenelon, 12-MV and AD-2000. High-strength Cor-Ten, Man-Ten and Tri-Ten steels will also be represented.

Products displayed will include extruded parts for aircraft, forgings, and Lorig Aligners for aligning belted conveyor systems, tin plate lines, billet aligning and other industrial applications. *United States Steel Corp., Booths 1527-1533.*

Circle 37 on postcard for more data

Lubricating System

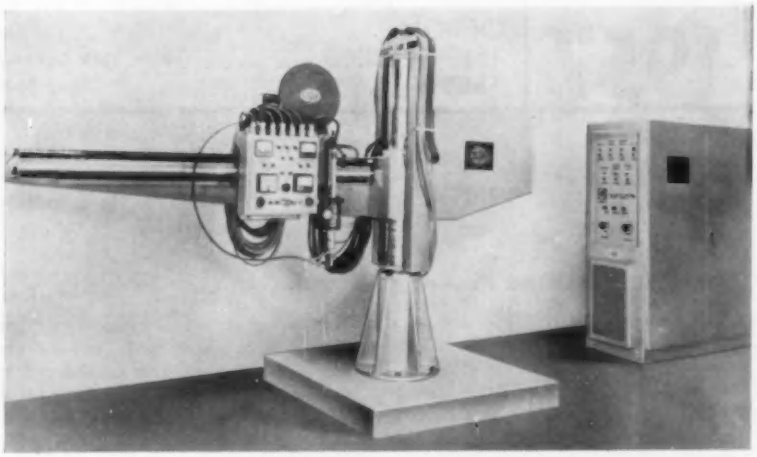
An exhibit will display a new type of circulating oil system for supplying the lubricating needs of presses, automatic and semi-automatic machine tools, and other like equipment. To be marketed under the trade name Lubrival, it employs the company's two-line principle of operation to supply oil under pressure to Progressive Dualine measuring valves for delivery to bearing points. The valves have individual sight indicators and feature the positive piston displacement method of feeding lubricant. The system monitors its own operation through a pressure sensing mechanism, to warn of clogged or broken lines in any part of the system.



Lubrival system with manifolded group of measuring valves (top) connected to reversing valve or control panel. Other components include a reservoir, high-low pressure switch, ½-hp motor, variable delivery pump, and twin filter

For operating flexibility, a variable-delivery pumping unit permits a wide range of selection in the number of injections per minute applied to bearing points. There is said to be no limit to the number of measuring valves that can be manifolded together, and the valves are made in two capacities. Each valve is designed to serve two bearings. Temperature-induced changes in oil viscosity are stated to have no effect on valve deliveries. *The Farval Corp., Booths 222, 224.*

Circle 38 on postcard for more data



Air Reduction welding head manipulator and control console, designed for welding jet engine components and other intricate parts, features universal positioning

Welding Head Manipulator and Control Console

To be demonstrated will be a welding head manipulator and control console for longitudinal and circumferential welding. The unit was engineered for the purpose of universal positioning and accurate variable speed traverse of the welding head.

The manipulator is said to have been especially designed for precision welding applications on aircraft jet engine components and similar intricate parts. Both Heliwelding (tungsten inert gas arc-welding) and Aircomatic (metal inert gas arc-welding) heads may be mounted on the device.

The electrical console provides the necessary controls for complete programming of the welding operation. Electronic timers are used for sequence control. Console includes welding power source with current slope control, accessories for control of shielding and back-up gases, and a self-contained water circulating unit. *Air Reduction Sales Co., Booth 1645.*

Circle 39 on postcard for more data

Bearings and Seals

Samples of two new product lines will be shown by a company. This exhibit will feature F-55 copper-lead alloy bearings, steel-backed, designed to fill the gap performance-wise between the babbitt type of sleeve bearing and the heavy-duty tri-metal type. While other materials are primarily of cast construction, the F-55 is sintered. This is said to produce a bearing approaching that of babbitt for good surface action, because of the fact that much higher percentages of lead can be obtained in the finished product; while surpassing babbitt in service life.

Carbon seals, in a line, will also be exhibited, designed for long service at up to 700 F, or for limited life (missile) service at up to 1200 F. Designs will include standard shaft seals, seals for use between rotating shafts, and face seals. *Cleveland Graphite Bronze Co., Booth 1829.*

Circle 40 on postcard for more data

1957 DESIGN ENGINEERING SHOW

New York Coliseum
May 20-23

FOR ADDITIONAL INFORMATION
please use reply card on PAGE 89

Standardized Power Transmission Components

The trademark Cycledyne has been applied to a new line of power transmission components which will be displayed at the show. The Cycledyne is a start-stop power drive and control device that provides cyclic operational functions for the machine, including starting, stopping, inching, positioning, holding, acceleration control, deceleration control, and torque limiting. A continuously-running electric motor supplies the driving power. The input shaft of the Cycledyne is driven by the electric motor and the output shaft, in turn, drives the machine. This permits the drive motor to rotate continuously, irrespective of the start-stop action of the machine, so that it is possible to utilize the motor armature as a supplemental flywheel, permitting fast cyclic rates. The device acts as an impulse starter at the beginning of each cycle, then functions as both a dynamic and holding brake for the machine at the end of each cycle. During the working phase of each cycle it locks in. Torque of the unit may be adjusted to any desired limiting value by remote rheostat control. Rates of acceleration and deceleration are also selective, and may be adjusted by means of two small rheostats in the control circuit.

There are five basic sizes of the Cycledyne, available with foot, flange or face mounting options compatible with NEMA motor dimensions, and, with open, splash-proof and totally-enclosed fan-cooled options. More than 200 combinations of frame assembly variations and interchangeable design modifications are offered. *Cycledynamics, Inc., Booth 1227.*

Circle 41 on postcard for more data

Foot-mounted, splash-proof, fan-cooled Cycledyne, arranged for coupling or belt drive at input end and output end

Stainless Steels

Among a range of products to be displayed will be piston ring expanders of stainless steel, stainless steel clad materials, and steel extrusions. Photograph will be shown of one of the largest and heaviest stainless steel plates ever sold by the company which weighs 25,275 lb and will be used in an atomic power plant. Other products in this exhibit will comprise a coil of special stainless steel AM-350, electrical steel laminations, carbide tools, and tool and die steels. *Allegheny Ludlum Steel Corp., Booth 1212.*

Circle 42 on postcard for more data

Fabric Products

Combining Teflon, Dacron, glass and other synthetic and natural fibers, a variety of engineered fabric products will be featured by one exhibitor. One of these is a new flat transmission belt designed for spindle speeds of 100,000 rpm. Called Rusco Ultra-Speed, it is said to last as much as ten times longer than other flat belts regardless of operating speeds.

Other products to be shown include new woven high-temperature oilless bearing supports, friction materials, glass electrical insulating tapes, and an extremely flexible conveyor belt. *The Russell Manufacturing Co., Booth 620.*

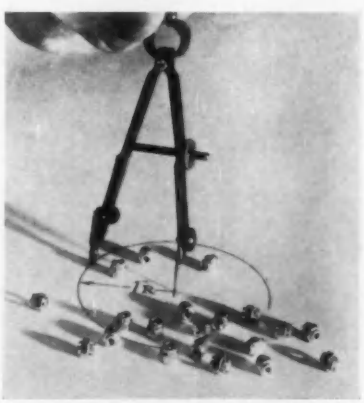
Circle 43 on postcard for more data

Light-Weight Fasteners

Displayed among a large exhibit of self-locking screws, miniaturized fasteners and locknuts will be the micro-sized self-locking clinch nuts illustrated that simplify the blind mounting of small components on thin-section panels by holding firmly in place without the use of a wrench as screws are tightened. They are available in sizes from 0-80 to 4-48. Also included in the display will be self-locking Unbrako socket screws equipped with nylon inserts, for service up to 300 F; a new series of light-weight steel locknuts, suitable for applications up to 550 F and available in the 10-32 and ¼-28 sizes; and an automatic driver machine for installing hexagon broached set screws to recommended torques.

The exhibit will additionally demonstrate the theory and practice of modern gaging techniques. *Standard Pressed Steel Co., Booths 416-420.*

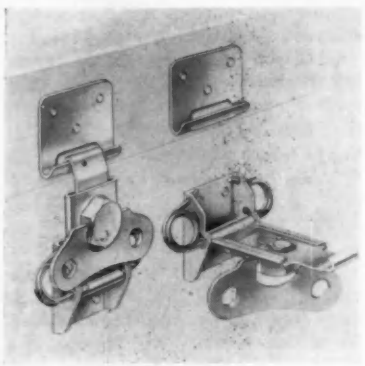
Circle 44 on postcard for more data



SPS miniature clinch nuts

Industrial Fasteners

The spring-loaded Link-Lock fastener will be included in a display of special fastening devices designed for industrial applications in the automotive, aircraft, electronic and construction fields. Recently introduced, the Link-Lock fastener provides mounting flexibility and take-up to compensate for set in gasketing, irregularities of sealing surfaces, and mounting inaccuracies. Said to be ideal wherever pressure-tight sealing



Simmons Link-Lock fastener

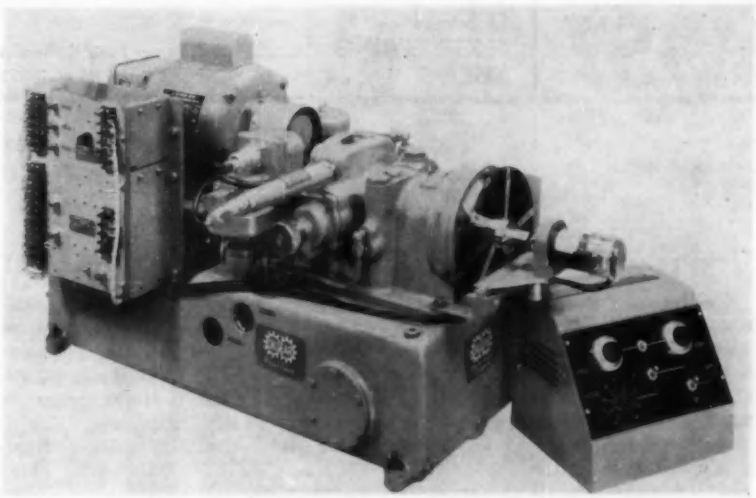
is required, it is available in two models, No. 2 (medium-duty) and No. 3 (light-duty). *Simmons Fastener Corp., Booth 528.*

Circle 45 on postcard for more data

Titanium Carbide

The main feature of an exhibit will be Kentanium, a heat-resistant titanium carbide developed for conditions where intermittent or continuous high temperatures in oxidizing atmospheres are combined with abrasion and compressive or tensile loads. Special working displays at the show will demonstrate its: (1) Thermal shock resistance, by heating Kentanium to 2000 F and quickly cooling to 300 F in a one-minute cycle while under a 12,500-lb load. (2) Oxidation resistance, by a side-by-side heating of Kentanium and nickel-chrome steel to show the effects of heat on each. (3) Wear resistance under high temperature, by heating the material to 1200 F and subjecting it to severe abrasion under a 2000 psi load. And (4) high modulus and low specific gravity. Parts made from the material will also be exhibited, including vane ring and impeller operated in a fired turbine for over 100 hours at 1900 F. *Kennametal, Inc., Booth 923.*

Circle 46 on postcard for more data



Oilgear electro-hydraulic servo controlled "any-speed" drive

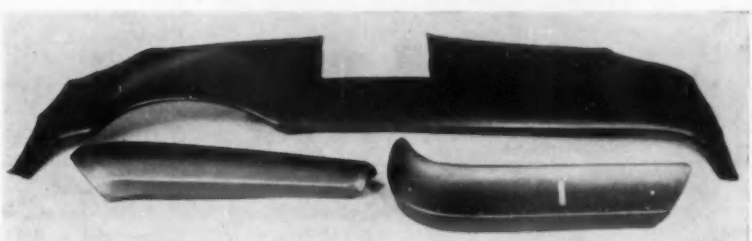
Electro-Hydraulic Servo Controlled Drive

Precision speed control and follow-up position control will be demonstrated with an electro-hydraulic servo controlled drive that is applicable to machine tools. For speed control, two dials and a selector switch on the command unit provide speed selection functions: Dials may be set for two different speeds in one direction and selected by a flip of the toggle switch. Dials may be set for any speed in one direction and another speed in the opposite direction; reversal is available instantly by a flip of the switch. Dials may be manually adjusted, resulting in stepless speed variation in either direction. Position control is available by flipping another toggle switch on the command unit; precise stopping positions can be selected at will with the position dial which has an infinite range of 360 deg.

In operation, an electric signal from the command unit is transmitted to an amplifier. The signal, in turn, is transmitted to an electro-hydraulic servo valve, which controls the flow of fluid to or from the transmission control cylinder. The control piston positions the slide block in the transmision to provide the desired volume and direction of fluid flow to the output drive unit. *The Oilgear Co., Booth 1740.*

Circle 47 on postcard for more data

Vinyl Plastic Clad Metal Laminate



The automobile seat side pieces illustrated, made of Sullvyne-Clad plastic to metal laminate, will be among the displayed applications of a company's vinyl plastic materials. The plastic is bonded to flat steel and can then be processed with the same equipment as plain steel. Also included in the exhibit will be the crash pad shown above, fabricated from Sullvac plastic cover sheeting. (O'Sullivan Rubber Corp., Booth 313)

Circle 48 on postcard for more data

1957 DESIGN ENGINEERING SHOW

New York Coliseum
May 20-23

FOR ADDITIONAL INFORMATION
please use reply card on PAGE 89

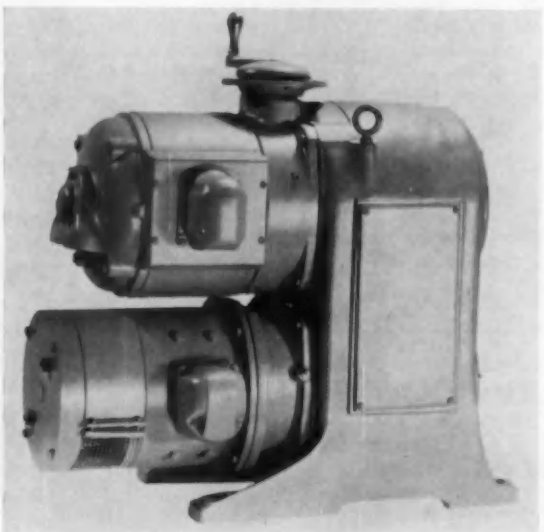
Unit Converts A-C Motors to Variable Speeds

The featured component in one exhibit will be a power unit called the Varidyne which makes it possible to convert any standard NEMA three-phase a-c induction motor from a fixed-speed motor into a variable speed drive. By connecting the induction motor leads to the new unit the motor receives a variable frequency current generated by the power unit. Speeds are changed at the power unit by means of a handwheel, or remotely by mechanical or electrical controls.

Any open, totally-enclosed, explosion-proof or internally-geared three-phase induction motor can be converted. The power units are available to handle a total connected load of from 1 to 50 hp, with speed variations of up to 5:1. More than one induction motor can be connected to the same power unit, and if they are of the same rating they will change speeds equally and simultaneously.

Units are available which will permit soft starts, inching and jogging of the drive motor. It is also possible to have the motor change speeds automatically by the addition of Varitrol pneumatic control to the power unit. Varitrol will operate automatically in response to such variables as pressure, temperature, position, liquid level, humidity, etc. *U. S. Electrical Motors, Inc., Booth 1644.*

Circle 49 on postcard for more data



U. S. Varidyne power unit converts any standard NEMA three-phase a-c induction motor to variable speed. It also permits multiple drive systems that are synchronized to provide simultaneous speed changes

Rivets and Drivers

Fasteners and related tools, in a full line, will be presented. To be exhibited for the first time is new oversize diameter Conical Keystone Lock blind rivets, for use in hole-fill applications where thin dimpled sheets are joined. A major portion of the booth will be devoted to demonstration area where visitors may see the various fasteners being driven by standard driving tools Among the products demonstrated will be Huckbolt fasteners, self-plugging blind rivets, Tau Bolt flush blind fasteners, pneumatic driving tools, and portable hydraulic power cells for use with the line of hydraulic driving tools. *Huck Manufacturing Co., Booth 837.*

Circle 50 on postcard for more data

Stress Analysis Kit

The Model ST-103A Stresscoat outfit, a complete kit for determining and evaluating streses, will be exhibited. Stresscoat is a brittle lacquer coating which is sprayed on the part to be tested and allowed to dry. When dry the part is loaded, and crack patterns of the coating indicate the relative stress concentrations in the part.

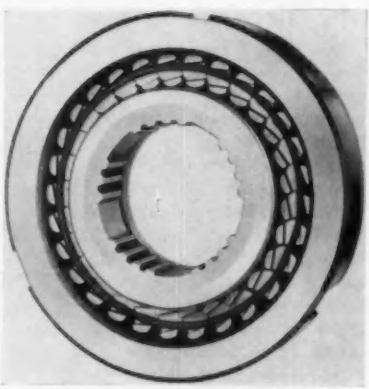
The kit for analysis of static load stresses, impact stresses, yield, residual stresses and dynamic stresses, includes materials and equipment for making quantitative and qualitative analyses. Metal cabinet contains spray gun, coatings, thinners, air gage, compressor air hose, gas mask, calibration strips, strain scale, selection chart, and Sling Psychrometer. *Magnaflux Corp., Booth 827.*

Circle 51 on postcard for more data

Overrunning Clutches

Clutches used in a variety of applications for indexing, back-stopping and overrunning will be exhibited. Being demonstrated will be a number of standard sprag-type clutches presently being used in diverse installations, some of which include feeding mechanisms, stand-by drives dual drives and speed reducers.

Specifically designed clutches to meet requirements beyond the standard clutch range will also be shown. These will consist of several modified



Formsprag sprag-type clutch used for automobile automatic transmissions

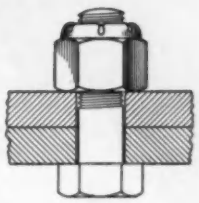
models, typical of those used in the aircraft and automotive fields for rudder actuators, alternator drives, landing gear actuators, and torque converters.

In addition to sample clutches, there will be animated displays demonstrat-

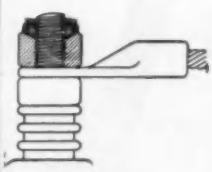
(*Turn to page* 142, *please*)

Ten fastening problems solved by ELASTIC STOP® nuts

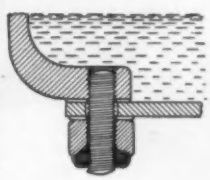
TIGHTENED AGAINST THE WORK



Vibration and impact proof bolted connections in standard applications.

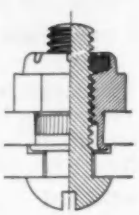


On all electrical terminals subjected to vibration in transit or operation, and for any electrical or electronic assembly where positive contact must be maintained.

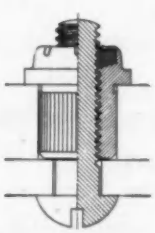


To seal bolt threads where leakage past stud threads must be prevented.

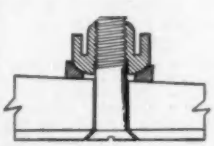
FOR MANY SPECIAL FUNCTIONS



Blind fastening applications where nut is "clinched" into sheet metal . . . becoming self-retaining as well as self-locking.

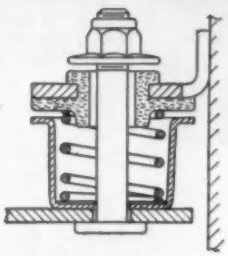


To eliminate drilling and tapping and provide steel thread strength for soft metals, an ESNA spline nut is pressed into a bored hole in casting.

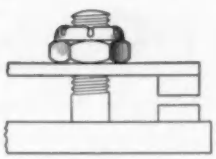


Simplified self-aligning self-locking fastener for bolting two non-parallel surfaces.

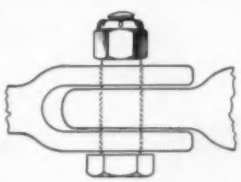
LOCKED ANYWHERE ON THE BOLT



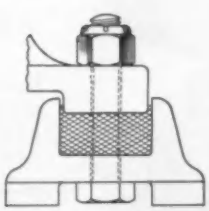
Spring-mounted connections or dynamic balancing, where nut must stay put yet be easily adjusted. (Flanged face eliminates need for extra washers.)



On make and break adjustment studs where accurate contact gaps must be maintained. Note "thin" height design for limited clearance.



For bolted connections requiring predetermined play.



For rubber-insulated and cushion mountings where the nut must not work up or down.

HOW THESE NUTS SOLVE SO MANY FASTENING PROBLEMS, ELIMINATING EXTRA PARTS AND OPERATIONS...

The red locking collar of an ELASTIC STOP® nut grips bolt threads with a perfect fit that will not loosen under severe vibration or stress reversals, and seals against liquid seepage. By bringing nut and bolt metal thread flanks into firm contact it eliminates wear producing axial play. The elastic locking action of the insert-type stop nut does not distort or gall bolt threads. It is reusable many times.

Send for the following free information: Elastic Stop nut bulletin; Rollpin® bulletin. Or enclose a drawing of your product for specific self-locking fastener recommendations. Write to Dept. N30-55.

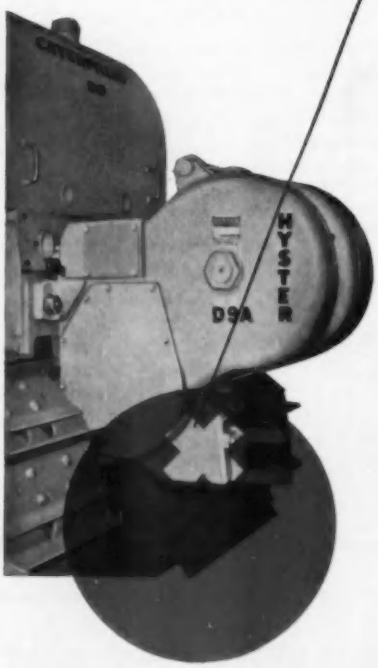
ELASTIC STOP NUT CORPORATION OF AMERICA
2330 VAUXHALL ROAD, UNION, NEW JERSEY

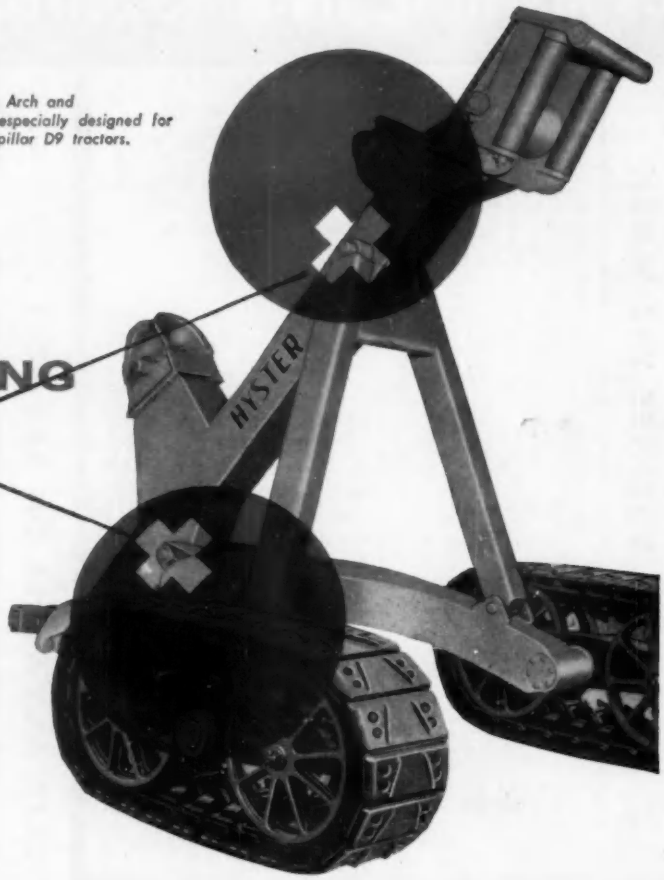
Hyster "98" Logging Arch and D9A Towing Winch especially designed for operation with Caterpillar D9 tractors.

by switching to

OSTUCO TUBING

here and here...





Hyster Company Makes Double-Cut on Costs!

Hyster Company, Portland, Oregon, out to beat machining costs of components in their logging arches and winches and a drawbar bracket, turned the trick by switching from another material to OSTUCO Seamless Steel Tubing.

Drawbar Bracket—Use of OSTUCO Tubing cut material and machining costs from $120,500 to $81,820 annually for a reduction of 32%.

Logging Arch—Used as sleeves in the Hyster "98" Arch, OSTUCO Tubing reduced material and manpower costs 10% annually.

In addition, Hyster engineers report the equipment is stronger and better able to take the strain of heavy hauling and winching jobs over rough logging terrain.

Perhaps you have hidden profit-robbers in your product. Better contact OHIO SEAMLESS for recommendations . . . without obligation on your part, of course.

OSTUCO TUBING

MANUFACTURED IN
SHELBY, OHIO
EXCLUSIVELY BY

OHIO SEAMLESS TUBE DIVISION
OF COPPERWELD STEEL COMPANY

SHELBY, OHIO • Birthplace of the Seamless Steel Tube Industry in America
SEAMLESS AND ELECTRIC-RESISTANCE WELDED
STEEL TUBING • FABRICATING • FORGING

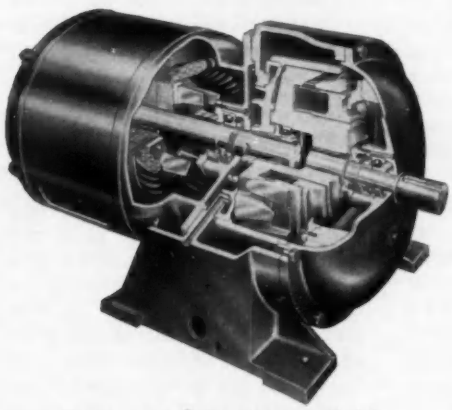
SALES OFFICES: Birmingham • Charlotte • Chicago (Oak Park) Cleveland • Dayton • Denver • Detroit (Ferndale) • Houston Los Angeles (Beverly Hills) • Moline • New York • North Kansas City • Philadelphia (Wynnewood) • Pittsburgh • Richmond Rochester • St. Louis • St. Paul • St. Petersburg • Salt Lake City Seattle • Tulsa • Wichita
CANADA: Railway & Power Engr. Corp., Ltd.
EXPORT: COPPERWELD STEEL INTERNATIONAL COMPANY, 225 Broadway, New York 7, New York

No Commutators, No Rings, No Brushes, No Rotating Coils—in the NEW

EATON

DYNAMATIC®

Adjustable Speed Drives



Dynaspede® Stationary Field Coupling, with Integral Motor

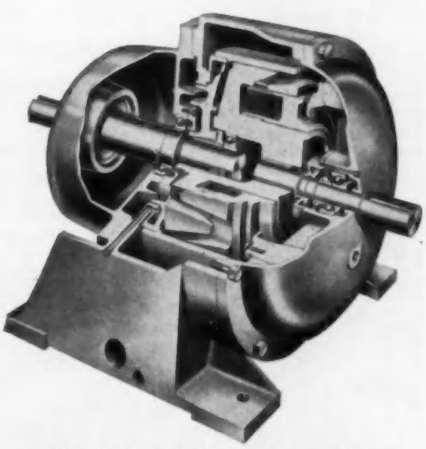
Dynamatic stationary field couplings are the simplest drives so far devised to provide infinitely adjustable speed from an alternating current source. The absence of rotating coils, brushes, slip rings, and commutators in this design holds wear and maintenance to an absolute minimum. Dynamatic electronic or magnetic amplifier controls, in combination with these drives, provide wide latitude in operating functions.

Check these Outstanding Advantages:

Accurate speed control • Wide speed range • Low power losses • Simple construction • Rapid response • Remote control • Quiet, efficient operation • Low maintenance costs

Ajusto-Spede® Drives: Air cooled, stationary field eddy-current couplings mounted integrally with D-flange open drip proof squirrel cage motors are available in capacities from 1 to 75 HP. Units of the same design and capacities are also available without motors.

Dynaspede® Drives: Liquid cooled, stationary field couplings mounted integrally with D-flange squirrel cage motors are available in capacities from 3 to 75 HP. Motor types available are drip proof, splash proof, totally enclosed fan cooled, and explosion proof. The coupling is totally enclosed. Separately mounted couplings are also available in capacities from 3 to 2500 HP and larger.



Stationary Field Coupling for use with Separately Mounted Motor

Send for Detailed Information on these New Stationary Field Couplings and Drives

EATON DYNAMATIC DIVISION MANUFACTURING COMPANY
3307 FOURTEENTH AVENUE • KENOSHA, WISCONSIN

News of the MACHINERY INDUSTRIES

By Thomas MacNew

Shipments of Machine Tools During March Set Three-Year Record with Total of $89,850,000. Cross Has All-New Facility for Production of Automation Machinery.

Tool Shipments High

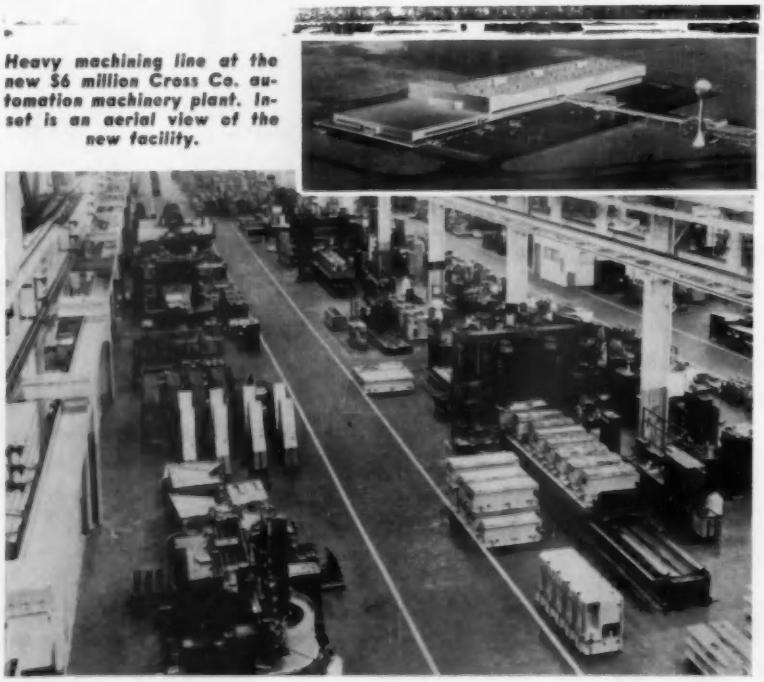
Machine tools are going out of producers' plants much faster than the salesmen are bringing in the new orders. March hit a three-year record high with shipments totalling $89,850,000. Orders on the other hand were only for $60 million, about two-thirds of the March '56 total. New business is expected to run in the neighborhood of $800 million for the year as compared with $924 million for '56 and $927 million for '55.

Cross Opens First Automation Plant

The new $6 million Fraser, Mich., factory and office building of the Cross Co. is said to be the first all-new facility in the country created solely for the production of automation machinery. This completes the first phase of the Cross company's long-range expansion program. The firm now has capacity for an annual sales volume of $15 million, and floor space to eventually increase capacity to a $25 million volume.

Among the many plant features are: simulated line production, a data processing department with a Univac high-speed electronic computer, and a novel engineering set-up that provides inter-company competition for engineering ideas.

Milton O. Cross, Jr., president, and Ralph E. Cross, executive vice president, explained the move. "Our decision to invest millions of dollars in new facilities was based on simple arithmetic and common sense. We have no crystal ball and we are not soothsayers. But economists and business statisticians are agreed that this country's population will mount rapidly in the next decade and more. However, they also point out that the supply of labor will not keep pace. This can mean only one thing. Machines, especially automation equipment, must take up the slack by producing more to fulfill the increasing requirements of the many millions of people who will be added to our present population."



Heavy machining line at the new $6 million Cross Co. automation machinery plant. Inset is an aerial view of the new facility.

Automatic Size Control For Honing

To obtain the required accuracy and high production rates for many operations, automatic size control has become an absolute necessity. Especially true in controlling the dimensional accuracy of cylindrical surfaces, this need has led to the development of several methods of automatic sizing on highly automated machines. Micromatic Hone Corp. gages this accuracy four ways for its honing process—Microhoning. This is a low-velocity abrading process that generates geometric accuracy and functional surface finish as it removes stock and holds diametric size.

Gage Ring

In use for over 12 years, gage ring Microsize has been, and still is, one of the most successful means of automatically controlling diametric size. In this type of automatic sizing the tool functions as an expanding plug. As the tool rotates and reciprocates through the bore, plastic encased abrasives are forced out radially to keep in constant contact with the work surface. As the self-dressing abrasives shear stock from the bore, the plastic wears at the same rate as the abrasive. The diameter of the tool—across the contact faces of the abrasives—is always exactly equal to the diameter of the bore.

A gage ring with an ID equal to

the final desired bore diameter is mounted above the workpiece. It is positioned so the plastic tabs on the ends of the abrasives enter the ring at the top of each stroke. When the bore, along with the tool, is the same diameter as the ring, friction between the rotating plastic tabs and the gage ring causes the ring to turn through a small arc. This movement of the ring triggers an air switch or an electronic pickup initiating the sequence that ends the cycle.

Gage Bar

In this type of automatic sizing the bore is gaged by two bars that float on the body of the tool. The bars are held out against the bore by spring pressure. The distance between the contact faces of the bars is the measure of the bore diameter. These bars are fastened to a split ring, hinged at a point 90 deg from the bars. Opposite the hinge, and positioned to permit easy access, are two low potential electrical contacts, one adjustable.

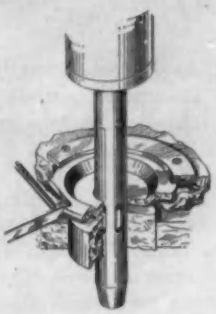
When the tool enters a rough bore, the bars are pressed in and the contacts are held apart. As the bore is honed the contacts move closer together. When the bore is to size the contacts meet and the cycle is terminated.

Gage Plug

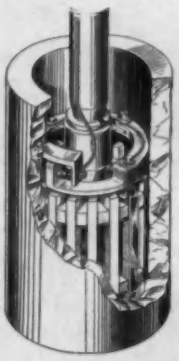
In this type of size control a plug having the OD equal to the desired bore diameter tries to enter the bore at each reciprocation of the tool. It may be mounted around the drive shaft of the tool (but floating independent of the tool), or, in the case of a horizontal machine, it may be mounted at the opposite end of the bore.

The plug is attached to a concentric, metallic bellows. The pressure that causes the plug to try to enter the bore is the result of air expanding the bellows as the tool stroked through the bore. The flexibility of the bellows provides "float," permitting the plug to align itself with the bore.

When the workpiece is honed to the desired size, the plug enters the bore. This triggers a switch in the air circuit and terminates the cycle.



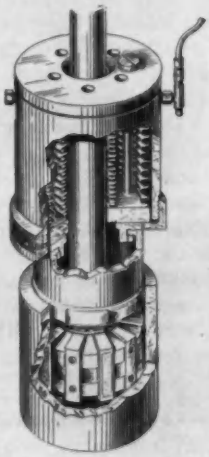
Cutaway view of the gage ring Microsize assembly and workpart, showing the tool at the top of its stroke. Note that only the upper plastic tabs of the abrasive assembly enter the gage ring. These tabs in the expanding, clockwise-rotating tool contact the ring which, in turning, flexes the leaf spring at the left to initiate the "to size" impulse. Tab contact and spring flexure occur in a fraction of a second.



Cutaway shows gage bar Microsize tool in an unfinished bore, with electrical contacts held open. Contacts come closer together as stock is being removed, and meet when final size is reached.

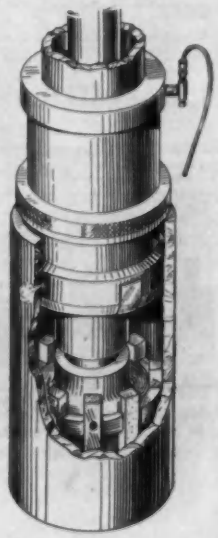
Gage Air

One of the latest developments in automatic size control, gage air Microsize consists of an air gage that, as the bore approaches final size, enters the part on each reciprocation of the tool. The gage strokes with and around the drive shaft of the tool, but floats independent of it. The gage is slightly smaller than the finished bore diameter. As the bore approaches the desired size the gage indicates the diameter on a dial. When there is the proper clearance between the gage nozzles and the bore, the decreased back pressure drops out a pressure switch and initates the sequence that ends the cycle.



Cutaway view of the gage plug Microsize assembly and workpiece, showing the gage plug just entering the "sized" workpart. Note the concentric bellows around the driveshaft which permit the plug to float with the tool but to remain independent of the force of the stroking speed.

This type of automatic size control has proved particularly successful on multiple spindle machines honing automotive cylinder bores. Each tool is separately controlled and the tool feed and size control adjusted to meet the condition of the respective bore as it comes to the machine. Size can be easily adjusted, without loss of production, to generate bores to



Cutaway of workpart reveals gage air Microsize in action. The tool is at the bottom of its stroke. One of the two or more air orifices is seen as the air gage enters the workpiece; through decreasing back pressure, the diameter begins to register on a dial on the control console.

match any desired piston diameter.

The pneumatic controls are divided into two parts. One component, consisting of a regulator, restriction and booster unit, is mounted on a bracket as close as possible to the tool. This proximity assures fastest reaction and closest precision control. The second component (the visual size indicators, and size adjustment controls) is placed in a remote control console.

Grinders Enter Horsepower Race

Four grinders in a new line, emphasizing power and size, were shown recently by Mattison Machine Works, Rockford, Ill., to an industry group to acquaint them with the capabilities of these machines. The machines in the group were a 150 hp horizontal spindle face grinder, a 75 to 60 hp plano grinder, a 100 hp vertical spindle face grinder, and a 75 hp combination way and surface grinder.

The trend in grinding machinery has been to higher horsepower, it was stated, in part due to the increasing use of harder, more costly materials. A grinder that was driven with a 40 hp motor a few years ago for steel, an executive said, is now powered with a 150 hp motor for polishing titanium and other hard, high-priced sheet materials.

The automobile industry uses these large grinders for grinding flat surfaces on large dies, and for salvage work on cylinder blocks and cylinder heads, in addition to operations using many smaller pieces in one setup.

Cemented Diamonds Make Automated Grinders Feasible

A process that eliminates time-out for wheel dressing makes possible complete automation of production grinders. The first broad scale application in an automobile plant will be announced soon. Developed by Jones & Lamson Machine Co. and Koebel Diamond Tool Co., the process combines two developments: Perpetual form control (PFC) of grinding wheels employing form cutters using cemented diamond particles (CDP) in a powder metal cutter body.

The PFC equipment required consists essentially of attachments to existing machine designs. The cutter which maintains the wheel acts much like a milling cutter with thousands of cutting teeth set in the body in such a manner as to continuously generate an accurate form. The cutter is motor driven in contact with the wheel at a speed somewhat higher (up to 500 sfm greater) than that of the wheel. For optimum cutter life, proper coolant control is required, of course. Coolant is supplied at relatively high pressures (25 psi).

A differential feed arrangement advances the grinding wheel and cutter in the exact increments called for by removal of grinding wheel stock by the cutter, so that correct work size is automatically maintained during the life of the wheel.

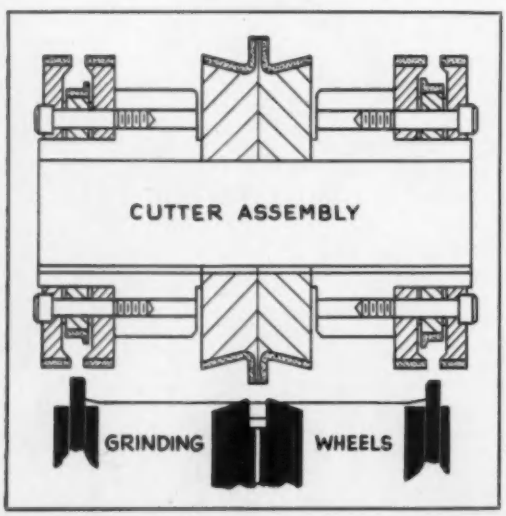
The process allows for the use of resinoid bonded wheels as well as vitrified and other types.

Cutters can operate in either intermittent or continuous contact with the wheel while it is cutting and yet cutter life ranges into the hundreds of thousands of parts. During this time there is no change in accuracy of the parts produced by successive grinding wheels.

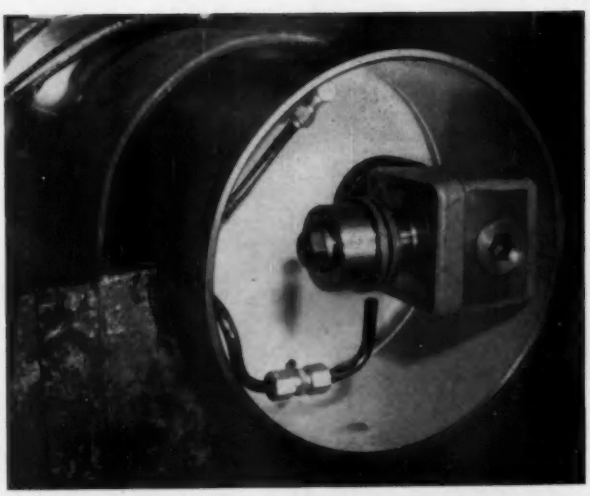
The cutters can be used to shape grinding wheels from the solid. Wheels can also have the forms removed with CDP cutters before cutting new forms in them. A 3/8 in. deep form, two inch wide, can be removed in less than five minutes.

The PFC control equipment which drives the cutter is compensating in character. Infeed of the cutter into the wheel is incremental. Similarly, the rate and frequency of the infeed of the wheel is adjustable to just balance

(*Turn to page* 152, *please*)



Assembly of multiple Koebel CDP cutters showing ways in which simple cutters can be combined to maintain form on complex wheels.



Simple Koebel CDP cutter mounted in a J&L PFC feed cylinder, removed from machine. Entire cylinder feeds forward keeping cutter in contact with wheel. Pressure jet cooling used.

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

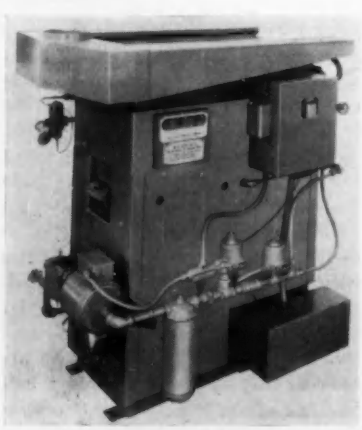
Ultrasonic Cleaners

SEVEN standard ultrasonic cleaning machines are being offered in a line that was recently announced. Removal of buffing and polishing compounds, honing and abrasive materials, machining chips and non-soluble deposits, including those in blind holes and inaccessible recesses, is possible without hand labor.

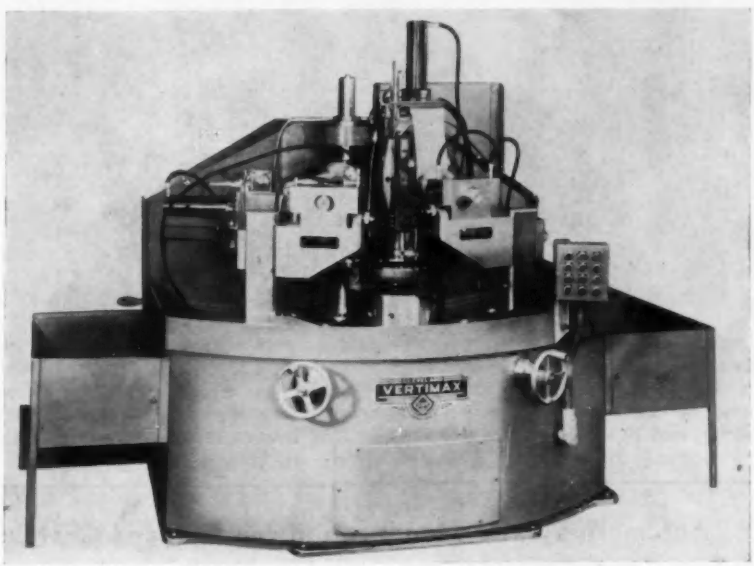
High peak levels of ultrasonic energy are transferred to the cleaning chamber through stainless steel encased barium titinate transducers. At an operating frequency of 40 kc, maximum cleaning or cavitation is said to result with minimum energy input. Cleanliness of the chamber is maintained to a 10 micron efficiency by a high-flow removable honeycomb filter element. A centrifugal pump supplies circulation and spray lance feed. The chamber is provided with a water-cooled jacket to maintain a temperature of 140 F. Self-actuating water control valve controls the water flow to hold the required temperature.

The machines are fabricated from heavy gage steel, zinc metallized or stainless steel clad. Available with steam, electric or gas-fired heating elements, equipment includes sump thermometers, drain valves, removable cleanout door, and bulb actuated water control valves. *Circo Equipment Co.*

Circle 65 on postcard for more data



Circosonic cleaning machine



Vertimax chucking lathe with guards removed to show twin tool slides

Automatic Vertical Chucking Lathe

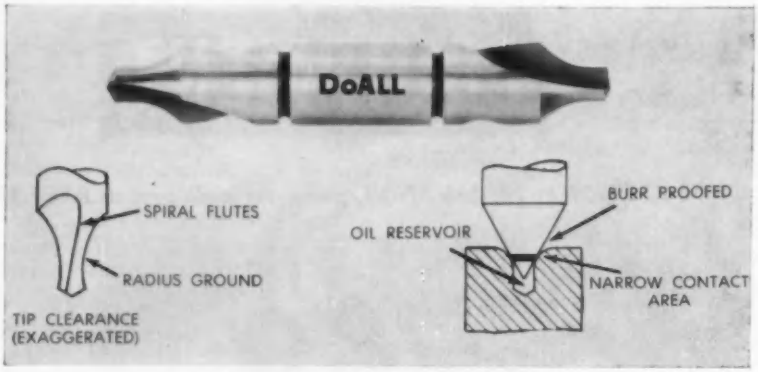
KNOWN as the Vertimax, an automatic vertical production lathe recently announced features a design based on tool slides supported at both ends for maximum rigidity against cutting forces, and a method of adjusting tool position by means of calibrated eccentrics. The tool slides, made from high-grade steel, hardened, ground, and automatically lubricated, can be swiveled from below horizontal to beyond the vertical position. This makes possible, besides normal turning and boring operations, the simultaneous machining of two internal, two external, or an internal and an external taper. Their calibrated eccentric adjustment enables the setting to be quickly made and noted for future repeats. The tool slides are cycled automatically by hydraulic controls which employ a differential feed system. Being thus hydraulically-locked, they are said to be ideal for interrupted cutting and other difficult machining operations. The differential system also senses unusual load conditions such as excess stock or broken tools, and will automatically return the slides.

Automatic rapid tool approach to cutting position and automatic tool relief for the return stroke are standard features. The tool slides can be operated simultaneously, or in any desired sequence. Depth of feed and slide travel are controlled by a mechanical positive stop providing repeat accuracy; or optional automatic size control (compensation for tool wear) can be furnished. A full-length recess is provided along the entire length of three sides to accept standard one by one inch carbide toolholders, retractable boring bars, and rocking toolholders.

Quick starting and stopping is accomplished by "plugging" the motor, eliminating the need for clutch and brake assembly. Variable-speed motor with controls to maintain constant cutting speed at the cutting tool, is optional.

The machines are available with complete automation, with automatic loading and unloading, with semi-automatic loading and unloading, with automatic size control, with additional tool slides, and with the constant-speed cutter drive. *Cleveland Hobbing Machine Co.*

Circle 66 on postcard for more data



DoAll D-400R radial type safety center drill

Center Drills Feature Cost Reduction

DESIGNATED as the radial type, adapted to precision work, and the heavy-duty type, for heavier work, two series of center drills recently introduced incorporate design features for reduced production costs and longer drill life. They are said to cost no more than ordinary center drills, and 10 to 15 per cent less than other types capable of giving protective centers.

The radial type center drill, D-400R, available in sizes 1 through 8, is ground to a radius. This eliminates the sharp notch area of the ordinary plain type which constitutes a possible fatigue point. The radius design also introduces a back taper to the drill portion which provides tip clearance that is said to substantially reduce drill breakage. Since spiral flutes are also used, these avoid "jamming," a further reason for drill breakage. This type of drill is applicable for precision work, since the small contact area and large oil reservoir lessen friction.

The D-400S heavy-duty type center drill, available in sizes 11 through 18, gives a larger contact area for use on heavy parts, while retaining the advantages of the radial type. Since this drill is ground with an 82-deg top angle, it deburrs the corners. This feature also enables the drill to be used for drilling and countersinking sheets where flat or oval head screws are to be used.

Both drills are said to insure high cutting efficiency through their helical relief on the cutting edge. Work centering is assured by the cutting of a protective center, compensating for cut-off irregularities. By providing a large oil reservoir, lathe center damage is also minimized. *The DoAll Co.*

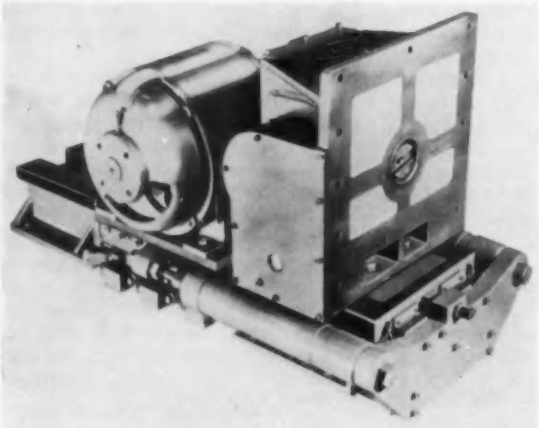
Circle 67 on postcard for more data

Automation Units Standardized for Reduced Costs

MUCH of automation's "specialness" is said to have been eliminated with the introduction of a line of standard automation components. The units were evolved from an analysis of prior machines designed by the company and a determination of what components of these machines could have been standardized as to sizes and types. The result is a series of components for Baker hydraulic machines that perform drilling, boring, facing, tapping and other operations.

These standard components consist of a line of hydraulic slides, drive boxes, and power sources for hydraulic feed. They are already in manufacture and are being incorporated into machines from single units up to many of the most complex transfer machines. Plans also include standardization of bases, spreaders, frames, heads and index tables. To these standard units are added those components which must necessarily be specials, such as some heads and tooling. The final machines, while basically standard, are also being equipped for full automation with loading and unloading devices and conveyors. *Baker Brothers, Inc.*

Circle 68 on postcard for more data



The Baker Model 1215 hydraulic slide, which includes twin-pull hydraulic feed cylinders, saddle, ways, limit switches and switch cams, and the 15-hp drive box pictured are units available in several standardized sizes for automation applications

Special Taps, Cutters

SPECIAL tipped and solid carbide taps and thread milling cutters, designed for threading abrasive materials such as aluminum, magnesium and plastics, are now being made available in a line. The tools are specially engineered to the individual application. In one instance the company's carbide thread milling cutters are reported to have increased output per sharpening from 750 to 40,000 pieces on the same aluminum threading operation. *Detroit Tap & Tool Co.*

Circle 69 on postcard for more data

Scrap Conveyor

STANDING only 4½ in. high, a vibrating conveyor featuring low headroom has been placed on the market for scrap-removal applications under metalworking machines. The extra low height is said to have been made possible because the trough vibrates on Neoprene springs. In addition to easier installation under machines where space is limited, stated advantages include low first cost, quiet operation, and variable speed mechanical drives. The unit can be arranged with drains for coolant collection and removal. *Carrier Conveyor Corp.*

Circle 70 on postcard for more data

Ultrasonic Grinder

INTRODUCTION of a low-cost, high-precision ultrasonic impact grinder for machinable areas ranging from 0.002 to 1-in. diam, has been announced. It utilizes ultrasonic energy to drill, slice, trepan, engrave and shape hard brittle materials, with tolerances to ±0.0007 in. and finish to eight microinches. Power source for the unit is 115-v ac, and water-cooling is not required. Bench mounted, the pedestal and driven unit is 23 by 16 by 15 in., and the driver 19 by 16 by 13 in. Weight is under 200 lb. *Raytheon Mfg. Co.*

Circle 71 on postcard for more data

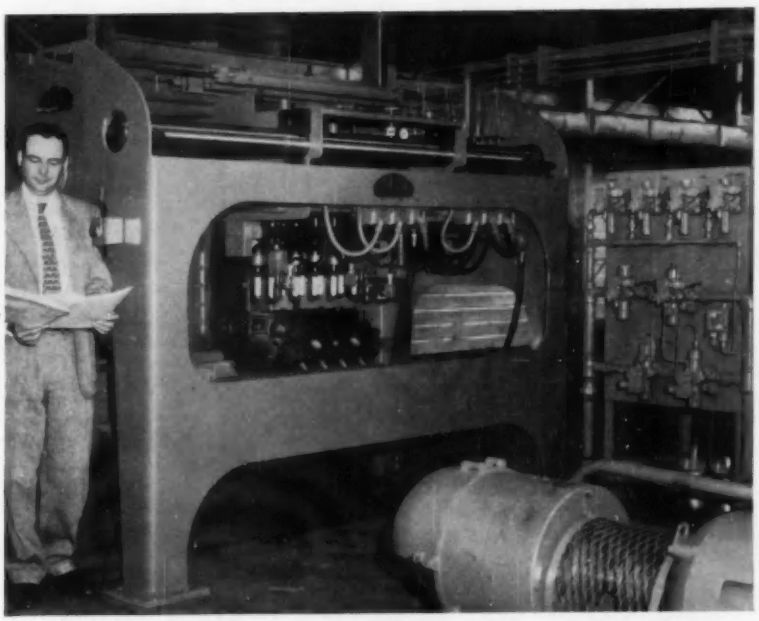
All-Hydraulic Truck

SPEEDLIFT is the trade name of an all-hydraulic line of gasoline and LP-gas operated fork trucks recently unveiled. Transmission of engine output is through a hydraulic pump which actuates a hydraulic motor. Braking is also handled hydraulically by putting the truck in neutral or depressing a brake lever. Simplification of design and elimination of components such as clutch, transmission, differential and drive shaft, with consequent lower maintenance needs, are said to result.

Weight of the truck is 4380 lb. Overall length, less forks, is 84 in. It will spin and turn in its own length as rear wheels turn a full 90 deg in either direction. The mast tilts 10 deg back and 6 deg forward. The truck also has deadman brake and cane type emergency brake. Interchangeable pneumatic or cushion tire wheels are available. Headlights and taillight are built in. Speed of the vehicle is up to 11 mph. *Pettibone Mulliken Co.*

Circle 72 on postcard for more data

Speedlift all-hydraulic fork truck



Cleco 10403-R bolt remover automatically handles main bearing cap bolts

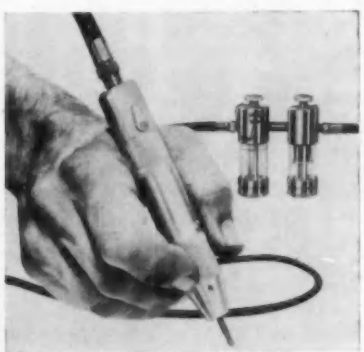
Multi-Spindle Unit Removes Main Bearing Bolts

THE latest in a line of units for use in automatic production line work is a 10-spindle bolt remover designated as Cleco Model 10403-R. The machine, of which two have been delivered to a major automobile manufacturer, is designed to remove the main bearing bolts from the cylinder block after the bearing caps and cylinder block have been bored, and prior to the installation of the crankshaft in the engine. Pneumatically-operated and electrically-controlled, the units are completely automatic, and will operate on continuously moving conveyor lines, where maximum production is 120 blocks (or 1200 bolts) per hour. This rate is well within the capacity of the machine, which is capable of up to 200 engine blocks per hour, a total of 2000 bolts per hour.

The bearing cap bolts are torqued to 100 to 120-lb-ft when the block enters the machine. To assist in breaking the bolts loose, a special one-blow impact mechanism was attached to the motor spindles of the 10403-R. This delivers a single sharp blow to the socket to assure positive loosening of the pre-torqued bolt. Limit switches and locating arm assemblies are utilized to bring the motor carrier into position over the moving block, to power the motors while bolts are removed, and to return the carrier to position for the next operation.

The motor used on these units is the newly-developed Cleco 400 Series which was specifically designed for multiple-spindle applications. Safety devices include a signal when air pressure is low. Special locating and sensing devices will cause the machine to reject an improperly-positioned engine block and at the same time blow a horn to attract attention. *Reed Roller Bit Co.*

Circle 73 on postcard for more data

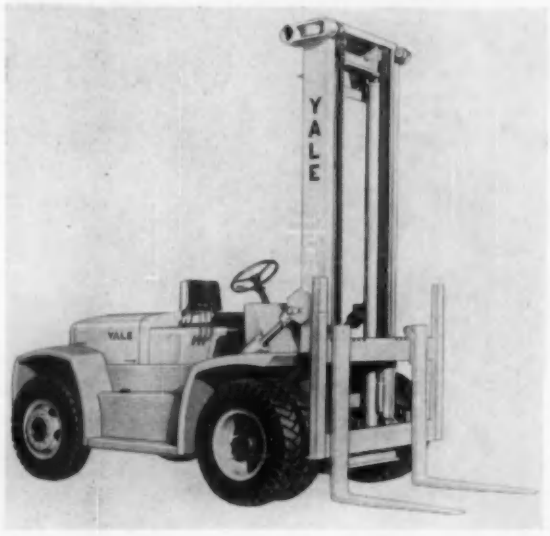


Air-Powered Grinder

Designated Model GA-125, this pencil-size grinder reportedly operates at 100,000 rpm on 80-psi air line pressure. Uses include grinding, deburring, cutting, polishing, and die and mold finishing. The turbine type rotor is said to float on a cushion of air, virtually eliminating bearing wear. It comes equipped with a filter-lubricator and six feet of nylon-reinforced hose. (The Bellows Co.)

Circle 74 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT



Yale G-3 series lift truck, one of the models in a new line comprising four capacities of 15,000, 16,500, 18,000 and 20,000 lb. Design features include accessibility of components for maintenance, ease of operation, improved operator visibility, load stability, and fast cyclic rate of operation.

Lift Truck Series of 15,000 to 20,000-Lb Capacity

DEVELOPMENT of an all-new line of 15,000 to 20,000-lb capacity, pneumatic-tire lift trucks was recently announced. Called the G-3 series, their stated features include improved operator visibility and load stability, and fast cyclic rate of operation. The line is being introduced in 15,000, 16,500, 18,000 and 20,000-lb capacity models, powered with gasoline or LP-gas engines.

The increase in operator visibility is said to have been accomplished through the use of two widely-spaced lift cylinders and nested channels. Chains for transmitting lifting power to the carriage are located in front of the lift cylinders, further freeing from obstruction the space between the lifting members. Use of this construction, in addition to a low center of gravity, also gives a broad base for lifting force and load stability. The tilt cylinders are fitted with anti-cavitation valves for preventing hydraulic pressure voids which result in channel drift.

The trucks have lifting speeds of 65 fpm, accomplished with a dual hydraulic pump. Lowering speeds, both loaded and unloaded, are said to be as rapid as possible consistent with safe operation. Travel speeds up to 20 mph are possible. Maneuverability is also featured, the hydraulically-actuated power steering arrangement turning the steer wheels through a 75-deg angular movement.

With fluid coupling, the truck is powered by a Chrysler V-8 industrial engine which develops 105 hp at 2800 rpm. With friction clutch, a Ford V-8 industrial engine of equal output is used. Both combinations have four speeds forward and reverse. Final drive is through hypoid gears and full-floating axles. Brakes are vacuum-powered hydraulic, the system including a reserve vacuum suply. *The Yale & Towne Manufacturing Co.*

Circle 75 on postcard for more data

O-Ring Kit

EVOLVED principally for ready maintenance use, a kit is now being marketed which contains 166 O-rings in 20 different sizes. It is said that the sizes included in the kit have been carefully selected from those most commonly used in industry and range from 72701 to 72720 inclusive. Interchange information on nationally-known makes of O-rings is also included. *Bearings, Inc.*

Circle 76 on postcard for more data

Press Brake Control

FOR eliminating whipping and resultant kinking of sheet materials during forming operations, a new accessory for hydraulically-operated Di-Acro press brakes is being offered. Called Let-Up Control, it enables the speed of the ram to be reduced up to 50 per cent just prior to the time that the die in the ram makes contact with the material being formed. While the forming part of the stroke is at slow speed, the return stroke is at maximum speed.

The basic element in the system is an adjustable flow control unit which can be adjusted to various speeds. Adjustment is made on a calibrated gage which is mechanically linked to a two-way valve which opens to allow hydraulic oil to flow through the flow control unit during the reduced-speed portion of the ram cycle. *O'Neil-Irwin Mfg. Co.*

Circle 77 on postcard for more data

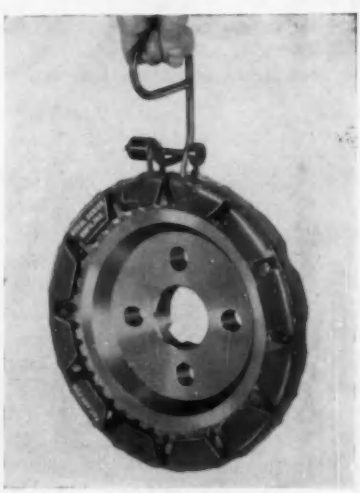
Cutter Guards

CUTTER GUARDS designed for protecting operators, machines, and cutting blades in the handling of multiple-tooth cutters, are in a series recently introduced. Called Cy-Co-Trol, each is applicable as a permanent accessory for a cutter. The need for applications of hot-dip plastic to cutters before storage is said to be eliminated by the use of these guards.

The cutter guard consists of a spring steel band to which loops are attached for easy assembly and disassembly of the cutter. A quick-action bolt fastens through the loops, locking the guard to the cutter. These loops also facilitate lifting the cutter to the machine. The complete unit is coated with a plastisol material, to assist handling and to protect the teeth of the cutter. The cutter identification is engraved in the plastisol.

Cy-Co-Trol cutter guards are available for any size cutter from 4 to 20-in. diam. Guards for cutters of larger diameters and guards for cut-off saws or special-shaped cutters can be supplied on special order. *Royal Design & Manufacturing, Inc.*

Circle 78 on postcard for more data



Royal Cy-Co-Trol guard for multiple-tooth cutter.

Mill Regulator Designed for High Continuity of Performance

DEVELOPED for applications in continuous-process mills, a new dual-circuit variable-speed electronic regulator is designed for drive control on machines requiring high continuity of performance, such as are common in the rubber, glass and non-ferrous metals industries.

Basically, the regulator, designated VSMR, operates on two sets of output thyratron tubes operating in parallel. Each set of tubes is capable of handling the output load without exceeding the tube rating. In normal operation, the tubes tend to share the load. However, in the case of tube failure in one-half of the regulator, the two tubes in the operable half automatically carry the entire load. The use of thyratron tubes in the power output section of the VSMR does away with circuit tuning and matching, as is the case in some other types of regulators. The output section will operate into the motor field or the generator field of any drive to control speed, tension and voltage.

Available in both 6-amp and 10-amp outputs, based on the capacity of one set of output tubes, the VSMR is said to reduce industrial electronic maintenance to the same category as changing electric light bulbs in the home. Thyratron tubes emit a bluish glow when in a serviceable condition, allowing a visual check of tube operation. Tubes can be replaced while the drive and regulator are operating.

Reliance VSMR variable-speed electronic mill regulator

Company-developed Sealpaks—special-purpose electronic circuits embedded in blocks of resilient plastic resin—are used throughout the regulator construction, so that all resistor components are protected. These "canned" electronic units may be checked with a voltmeter to determine serviceability, and replaced by any maintenance man, using only a screwdriver to disconnect and re-connect numbered terminal leads. A special test fixture is also available which permits a complete "bench-check" of the regulator by plug-in. *Reliance Electric and Engineering Co.*

Circle 80 on postcard for more data

Dry Acid Compound

DRYCID is a powdered acid material which was recently introduced for removal of rust, scale and corrosion with added safety to metal surfaces as well as personnel. Used with water in concentrations upwards of eight ounces to the gallon, it is said to go into solution fast and to be useful in applications by circulation or immersion. Solutions of the compound may be used cold, or for faster action, heated to 165 F. It is said to be effective in the removal of scale, scale-like deposits, rust, iron sulphides and other oxides.

Stated major advantages of this new material include its ease in shipment and in storage, as it requires no returnable carboys but is shipped in fiber drums; its mild, aromatic odor and nonfuming characteristic; and its greater safety on aluminum, brass and galvanized surfaces when used as recommended. *Oakite Products, Inc.*

Circle 79 on postcard for more data

Contour Projector Offers Added Versatility

Embodying a micrometer device for horizontal measurements, the new Kodak Model 14-6 contour projector shown also features ample table travel to simplify staging. In combination with the high-contrast viewing screen, the measurement device is said to make possible "magnified" micrometric measurements for toolroom optical gaging. The projector includes as standard equipment a movable worktable with both horizontal and vertical traverse. (Optical Gaging Products, Inc.)

Circle 81 on postcard for more data

Count on *Continental* to

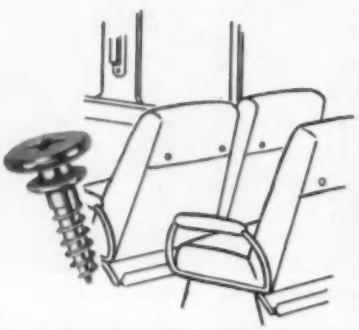
meet special fastening problems

with specialized cost-saving experience

Continental Assembly Engineers' Specialized approach to fastener trouble-shooting assignments gets you the right answer promptly, with the biggest cost savings — for two reasons.

First, since Continental can supply more types of standard fasteners, from stock, their recommendations are unbiased. They can tell you if some "standard" you've overlooked will meet your needs.

Second, if a "special" is the best answer, you can rely on Continental's unlimited experience to design and produce a fastener that will meet all specifications at the lowest possible cost.

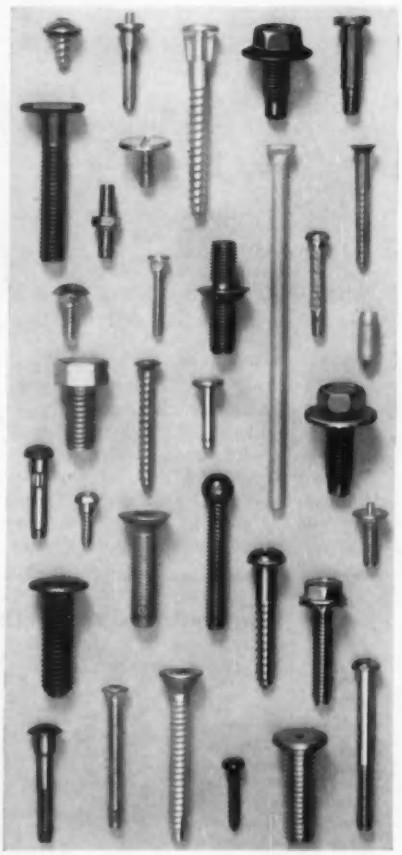


SPECIAL HOLTITE® PHILLIPS
button-head screw replaces two-piece fastening . . .

A bus builder asked Continental Assembly Specialists how to simplify installation of towel-holding buttons on back of bus seats. Separate wood screw and metal button being used caused slow work, with many pieces dropped and wasted.

One-piece button head special screw designed by Continental reduced parts cost 10%. Easy installation of simplified fastener provides much bigger saving in assembly costs.

COST LESS
SPEED ASSEMBLY



HOLTITE® NYLOK®
self-locking screws solve problem of screws loosening in chain saw

When consulted by a chain saw maker on the problem of screws vibrating out, Continental Assembly Specialists had the answer in HOLTITE® NYLOK. Two of the several types of machine screws furnished, all fitted with the resilient nylon plug, are illustrated. These NYLOK screws do not loosen in spite of extreme vibration, keep the saws "on-the-job". Previous customer complaints of high maintenance costs were eliminated.

END COMPLAINTS OF
HIGH MAINTENANCE COSTS

"Special" attention like this will pay off for you . . .

It costs you nothing to talk to a Continental Assembly Specialist. And, as soon as he digs into your problem, you'll see what we mean by "specialized experience". For prompt service, write or phone: Continental Screw Co., 451 Mt. Pleasant St., New Bedford, Mass.

MEMBER
SCREW RESEARCH
ASSOCIATION

CONTINENTAL
HOLTITE FASTENERS

HOLTITE PHILLIPS AND SLOTTED HEAD
WOOD • MACHINE • TAPPING • THREAD CUTTING • SEMS • NYLOK
HY-PRO PHILLIPS INSERT BITS AND HOLDERS

Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Stud Welding 1

Tips for design engineers on how to take advantage of the savings possible with stud welding are among the features of a 24-page Design Manual, available from *Nelson Stud Welding Div., Gregory Industries, Inc.*

Aircraft Castings 2

Aircraft castings of Ductaluminum 356, produced in two strength levels with guaranteed minimum mechanical properties in critical areas, are described in six-page folder. *American Brake Shoe Co.*

Worm Gear Drives 3

Finger-tip facts on a line of worm gear drives are given in 16-page bulletin 145, which provides summary data on speed reducers, worm gear sets and special units. *The Cleveland Worm & Gear Co.*

Industrial Gearing 4

Entitled "Industrial Gearing," new 12-page booklet B-7012 outlines design and manufacturing facilities for producing quality custom-made gearing. *Westinghouse Electric Corp.*

Furnaces 5

Bulletin 461, 12 pages, supplies details on a line of hardening, preheat, high-speed steel, tempering, and vertical furnaces, as well as on endothermic atmosphere generators. *C. I. Hayes, Inc.*

Adjustable Bed Presses 6

Presented in four-page bulletin 60E supplement are the Series D adjustable bed presses, extensively redesigned and equipped for secondary operations between automated presses in the production line. *Niagara Machine & Tool Works.*

Forging Hammer 7

Bulletin 361, six pages, describes a new piston-lift gravity-drop forging hammer called "Rigidrop," which is said to be a new conception in a simple-to-operate production hammer that strikes more blows per minute with finer control. *Erie Foundry Co.*

Aircraft Equipment 8

Design and performance information on aircraft electrical components of about 100 models that include generators, regulators, control panels, transformers, and motors, are contained in 12-page booklet 6023. *Jack & Heintz, Inc.*

Steel Balls 9

Specifications of steel balls for application in many types of mechanisms are given in a recently-published 12-page catalog, which also describes expanded facilities and indicates ability to produce balls of special materials such as high nickel or cobalt base alloys, tool steel, plastics, nylon and vacuum-melted materials. *New Departure Div., GMC.*

(Please turn page)

VOID After July 15, 1957 **5/15/57**

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

NAME ..... TITLE .....
(Please Print)

COMPANY OR BUSINESS .....

ADDRESS .....
(No. & STREET) (CITY) (ZONE) (STATE)

FIRST CLASS
Permit No. 36
(Sec. 34.9 P.L.&R.)
New York, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES
P. O. Box 66,
Village Station,
New York 14, N. Y.

Readers Service Dept.

FREE LITERATURE—*Continued*

Drive Unit 10

How the "Ultra-Speed" package drive unit is meeting many industrial requirements for d-c power to make possible higher flexibility of machines, is told in bulletin 51B8166A. Available in ratings from 5 to 200 hp, it is a d-c conversion device consisting of a motor-generator set and control equipment housed in a compact cabinet. *Allis-Chalmers Manufacturing Co.*

Press Oil Data 11

Bulletin 155, 15 pages, deals with hydraulic systems, preventive maintenance, oil specifications, and guide lubrication as related to hydraulic presses. *Lake Erie Machinery Corp.*

Retaining Rings 12

Specification and application data on Spirolox, a gapless two-turn coil-action retaining ring product, are contained in a new 1957 edition catalog and application idea manual. *Thompson Products, Inc.*

Industrial Freezers 13

Bulletin 2-57, four pages, shows six models of standard industrial freezers, mechanically operated and available to temperatures of −225 F in sizes from 1 to 45 cu ft. *Webber Corp.*

Extrusion Presses 14

Aluminum extrusion presses in a line are described and illustrated in six-page bulletin 340-C. *Watson-Stillman Press Div., Farrel-Birmingham Co., Inc.*

USE THIS POSTCARD

Drill Catalog 15

A new drill catalog which saves time in drill selection, has just been published. It includes details on a line of drills, end mills, reamers, tool bits and other related tools; two sections of the book being devoted to automotive and aircraft drills. *Besly-Welles Corp.*

Contour Attachments 16

The features and specifications of two new contour attachments for turret lathes are presented in eight-page illustrated bulletin 5702. *The Warner & Swasey Co.*

Industrial Filters 17

Described in a new eight-page general bulletin filter guide are six major filter types for industrial applications. *Industrial Filtration Co.*

Inspection 18

Presented in a new booklet is manual-type information on Zyglo and Zyglo-Pentrex fluorescent penetrant materials and fluorescent penetrant testing of non-magnetic products. *Magnaflux Corp.*

Optical Tools 19

Catalog on optical tooling equipment, 17 pages, lists jig transits, alignment telescopes, and tilting levels, together with a large number of accessories. *Keuffel & Esser Co.*

Collets and Feeders 20

Featured in new 24-page catalog No. 22 is a line of collets and feeders of various types. *Sutton Tool Co.*

Polyethylene 21

The April issue of *Extruderitems* describes DFD-4030 a new polyethylene material compounded for sheet extrusion and vacuum forming. *Bakelite Co.*

Titanium Tubing 22

Technical Data Card 185, 12 pages, presents the properties of seamless titanium pipe and tubing for pressure and mechanical uses. *The Babcock & Wilcox Co.*

V-Drive Catalog

Comprising 46 pages, a new V-drive catalog and engineering manual is presented as a convenient source of data on fractional horsepower drives, drive parts and accessories. Address request on company letterhead, specifying position, to *Maurey Manufacturing Corp., 2915 South Wabash Ave., Chicago 16, Ill.*

FIRST CLASS
Permit No. 36
(Sec. 34.9 P.L.&R.)
New York, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed In the United States

POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES
P. O. Box 66,
Village Station,
New York 14, N. Y.

Readers Service Dept.

VOID After July 15, 1957 5/15/57

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

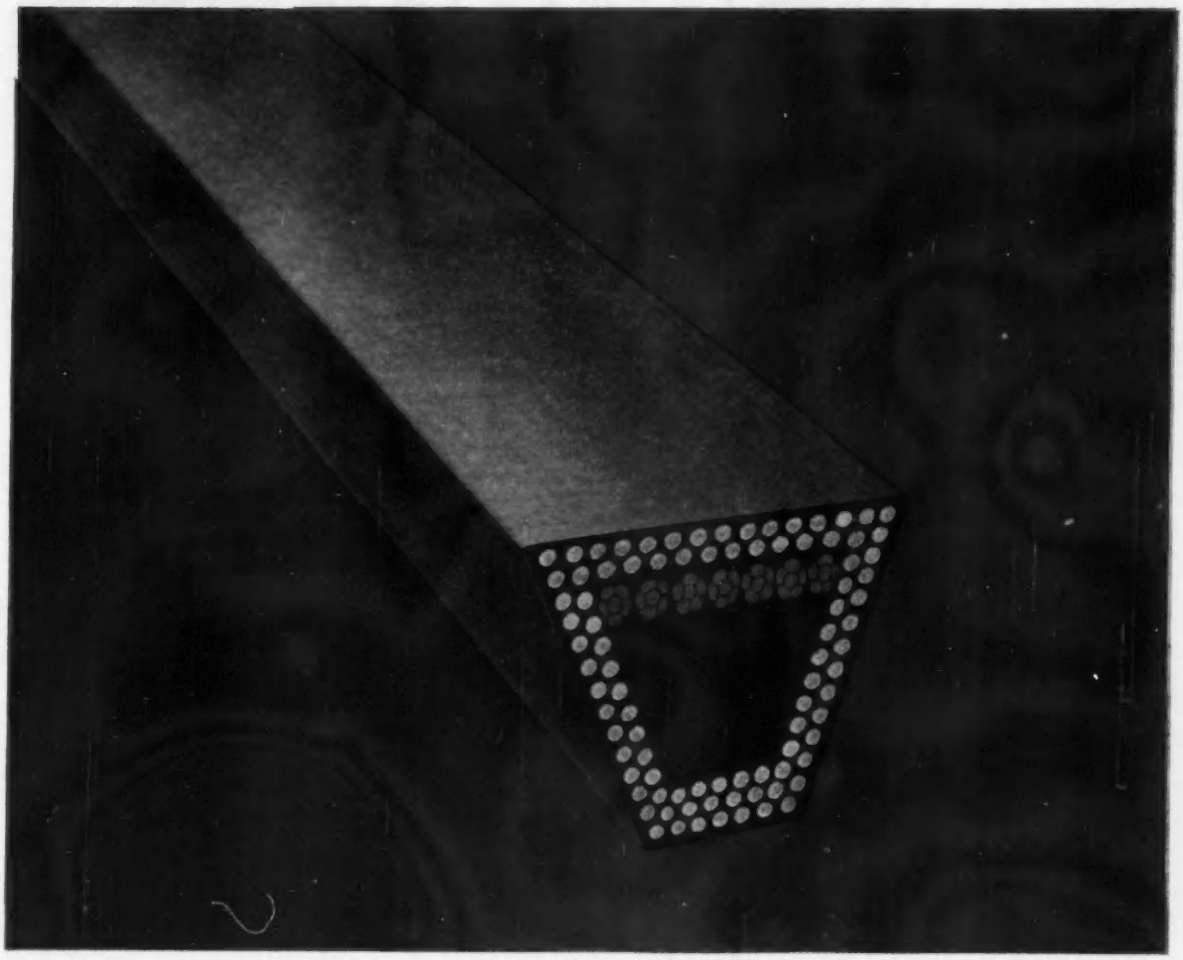
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

NAME ..... TITLE .....
(Please Print)

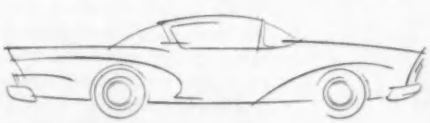
COMPANY OR BUSINESS .....

ADDRESS ..... (No. & STREET) ..... (CITY) ..... (ZONE) ..... (STATE)

AUTOMOTIVE V-BELTS



Quiet . . . smooth . . . vibration at the vanishing point



Unerring electronic controls; new methods of curing; the facilities of the largest and most modern plant devoted exclusively to the manufacture of endless transmission belts—these are the factors that bring to the automotive industry the one V-belt that erases vibration to the vanishing point.

The U. S. V-Belt contributes greatly to the silent and efficient operation of fan, generator, water pump, power steering and air conditioning . . . all part and parcel of today's finest automobiles.

Contact Automotive Sales, Mechanical Goods Division, New Center Building, Detroit 2, Michigan.
Phone: TRinity 4-3500.

Mechanical Goods Division

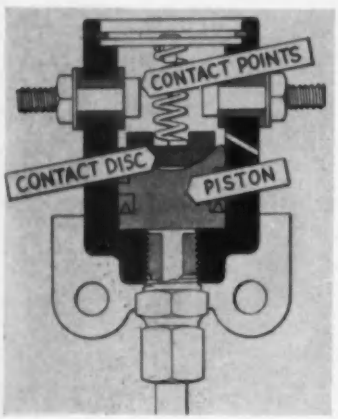
United States Rubber

NEW PRODUCTS
AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Stoplight Switch

In employing a piston action, a pneumatic stoplight switch just announced uses a piston of sintered self-lubricating material and a self-seating electrical contact disk. Contact



points are renewable. Each point has four usable silver-plated surfaces, designed to handle the amperage required by large multiple stoplights. The piston and disk, contact points, and non-current carrying spring are accessible upon removing the end plate held by a single retaining ring.

A new low-pressure indicator switch for actuating warning lights or buzzers is also being offered. It operates on principles similar to the stoplight switch, using the same piston action and renewable contact points. *Robinson Engineering & Sales Co.*

Circle 90 on postcard for more data

Plastic Material

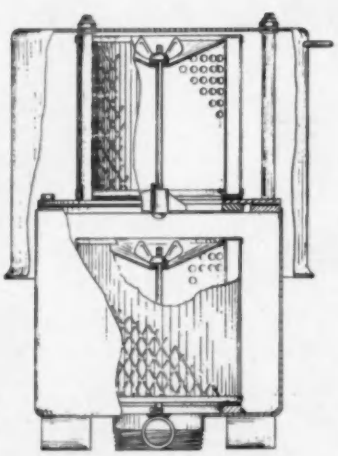
The discovery and initial development of a new plastic material which is reported to be tough enough to replace metals in many applications, was recently announced. The compound, called Lexan polycarbonate resin, is said to offer an unusual combination of toughness, impact strength, heat resistance and dimensional stability. Its properties suggest use in such applications as coil forms, gears, housings, structural parts, and electronic components.

The resin is now being made in small lots and is all going into the company's testing program. The polymer is being evaluated in the form of molding compound, extrusion compound, film, varnish and coatings. Until the present evaluations have been completed and pilot plant production established, samples will not be available for general distribution, the announcement emphasized. *General Electric Co.*

Circle 91 on postcard for more data

Air Filters

Heavy-duty air filters have been introduced in a new series designed for providing protection and uninterrupted operation of engines and compressors in heavily dust-laden atmospheres. Efficiency is reported to be 99.5 per cent. Each unit makes use



of a pair of elements in series, each containing 4800 sq in. of filtering area. Housings of the filter units are constructed of heavy gage steel, while the elements are made of convoluted resin-impregnated cellulose with a 3/32-in. steel base and cover. An expanded metal protective body of 3/32 in. steel shields the element from damage during rough handling.

Available in 100, 200, 400, 600 and 900 cfm capacities, the only servicing necessary is said to be air-washing and rapping of the first-stage element. The complete unit is about 30 in. high and 19¼ in. diam (for the 600 cfm model), while each element is 10 in. in length and 10¼ in. diam. Weight is approximately 70 lb. *Purolator Products, Inc.*

Circle 92 on postcard for more data

Control Motor

For operating rotary, slipstem and butterfly valves, dampers and other final elements in automatic control systems, a new electric motor is being offered. A reversing capacitor type, known as the Actionator, it is manufactured in two basic models. One unit (M-630) is designed for two-position and floating control; and the other (M-930) for proportioning control.

The motor units are about 6 in. diam and 10 in. wide and weigh 11 lb. They incorporate a gear train that permits a selection of timings from 7.5 to 120 sec, depending upon model. Proportioning control models permit positive positioning. For example, with a motor of 30-sec timing there are 90 positions of 1.8 deg each. To prevent coasting in any of the positions, the units have a built-in internal brake capable of holding a dead-weight load up to 200 lb. Limit switches, adjustable in the field, vary the travel from 10 to 350 deg for one model (M-630) and from 10 to 160 deg for the other model (M-930).

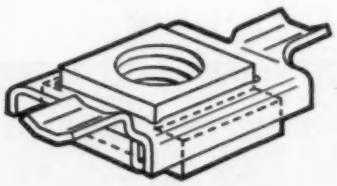
The new motors are designed to operate under temperature conditions ranging from 25 to 150 F. Electrical ratings are 115 or 208 v at 60 cycles, and 230 v at either 50 or 60 cycles. Both draw 25 watts. *Minneapolis-Honeywell Regulator Co.*

Circle 93 on postcard for more data

Fender Fasteners

Two new front-mounting fasteners, developed primarily for automotive fender applications, were recently announced. The self-retaining Speed Grips avoid welding and staking operations, and are said to permit ready installations where assemblies are not easily accessible.

One of the fasteners is a nut re-



tainer (illustrated) which is drifted into locked, bolt-receiving position with a simple tool. The fastener is claimed to provide excellent pull-out resistance, while affording ample float to handle normal manufacturing tolerances. It may be applied after painting.

Counterpart to the nut-retainer is a fastener which retains a fixed bolt. It operates on the same principle as the nut-retainer, and the bolt itself can serve as the drifting device. Tipped into a mounting hole from the front side, the bolt-retainer locks itself in place as it is drifted into perpendicular position.

Both Speed Grip fasteners are available in a wide range of screw and nut sizes and panel thicknesses for a variety of assembly applications. *Tinnerman Products, Inc.*

Circle 94 on postcard for more data

Liquid Fastener-Lock

Loctite, a liquid lock for threaded fasteners which hardens between fitting parts, is now available in four strengths to provide maximum resistance to vibration consistent with the type of application. Studs may be permanently secured and sealed fluid tight; or nuts and screws may be locked with a grip that is 60 to 70 per cent of the torsional strength of the fasteners, thus providing for disassembly without danger of breakage. For adjustment screws or nuts, the grade selected will afford a compromise between resistance to vibration and ease of adjustment.

The material is available in five grades with the following shear strengths: A and D 750-1000 psi; C 300-400 psi; E 150-200 psi; and H 75-100 psi. Grade D differs from Grade A in that it is more viscous, and is recommended where loose fits are encountered. *American Sealants Co.*

Circle 95 on postcard for more data

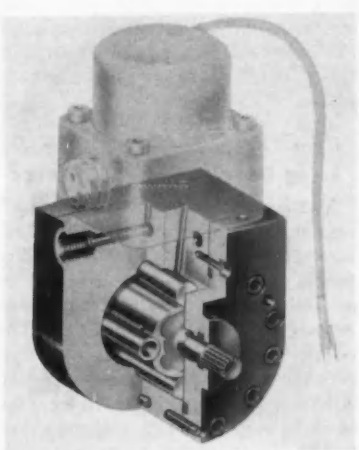
Rear-View Mirror

Introduction of a novel rear-view mirror that is automatically adjusted by an electronic device to prevent a motorist from being blinded by following headlights, has been revealed. The Mirrotron, as the device is called, is activated by a miniature photocell. Light striking the photocell is converted to an electrical impulse which, when amplified electronically, operates the mirror. The driver can adjust the point at which the mirror switches from the normal to dim position by means of a small dashboard control similar to a radio volume control. *Instrument Research Co.*

Circle 96 on postcard for more data

Rotary Actuator

Featuring simplified design, a rotary hydraulic actuator has been introduced for use in precision positional control servo systems at fluid supply pressures in the 3000 to 4500 psi range. Called Servotorque, it is said to offer static breakaway friction of less than one per cent of maximum stall torque, low internal leakage and minimum load coupling



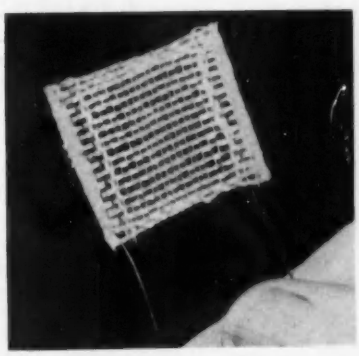
compliance. Construction minimizes structural redundancy through the use of cylindrical elements captively located in semi-cylindrical grooves for both the stationary and moving vanes. The design is stated to minimize load-induced structural distortion and permit effective sealing at both the stationary and moving vanes despite pressure-induced radial expansion of the stator.

The device is offered in a variety of sizes from 100 lb-in. to 6000 lb-in. stall torque (rated at 3000 psi supply pressure). Most of the units incorporate integral mounting provisions for standard valves, with pressure and return ports per AND-10050. *Aviation Div., Kelsey-Hayes Co.*

Circle 97 on postcard for more data

Transducer

A surface-temperature transducer accurate between —320 and 950 F has been developed. Designed originally for use on guided missiles,



the transducer consists of a woven grid of fine platinum wire. It can be attached easily to any surface with a special dielectric cement provided by the company, the grid interstices providing an excellent mechanical interlock. Purchasers can specify a 100-ohm change or more over an assigned temperature span of 100 to several hundred degrees.

About the size of a postage stamp, the device has a high thermal mass because of the grid design, and thus can follow rapid temperature transients quite closely. Mounted on 0.032 in. stainless steel sheet beside a thermocouple, it is said to follow the thermocouple's responses in less than 0.5 sec.

To go with the transducer, the company also has developed a lead tape composed of strands of fine silver woven into porous glass. It can be attached to surfaces with the same cement used for the transducer itself. The tape is available with either two or three conductors. *Charles Engelhard, Inc.*

Circle 98 on postcard for more data

AVIATION MANUFACTURING

Copyright 1957 by Chilton Company

Air Force Lowers Output Rate Of Boeing B-52's and KC-135's

Air Force heavy bomber wings will be fully equipped with B-52 planes, but deliveries are to be a little slower than was first planned.

Instead of raising production to 20 bombers a month, Boeing Airplane Co. is to continue output at the present rate of 15 a month. Boeing is also to raise output of the high-speed KC-135 tanker to the same rate of 15. This increase will take about one year.

Its decision to lengthen the B-52 buying schedule by some six months means no change in plans to buy 603 of the long-range bombers, the Air Force says. No savings can be expected in procurement outlays.

A primary reason for holding the output rate at 15 and not going to the 20-plane rate indicated last year is to get a better plane. The Air Force says a better B-52 now is in the works. A second factor in the stretch-out is the easing of the transition load in training B-36 crews to fly the B-52.

Also, the Air Force now feels less pressure to get full delivery of the B-52 in a hurry. Latest intelligence reports indicate the Russians have fewer fully modern intercontinental bombers than was thought earlier.

There is no apparent intent now to press for production of the still newer and faster B-58 as a replacement for the B-52. The Air Force says only that the B-58 development will be on a high priority basis.

Fairchild to Make Prototype of New Four-Engine Aircraft

Fairchild Engine & Airplane Corp. is proceeding with production of a prototype of a new four-engine aircraft to be known as the Turboboxcar. It is being financed in its present stage by Fairchild, and will be equipped with Lycoming T-55 turboprop engines of about 1600 hp each.

The plane follows the design characteristics of the C-123 assault transport powered with two piston engines. Over 1400 C-123s have been built for the military services.

Fairchild states that the new T-55 Lycoming engine has considerable growth possibilities and will be certified for commercial use. The Turboboxcar is designed for use on small airfields or aircraft carriers. It will carry 32,181 lb of cargo for ranges up to 1500 miles.

DOUGLAS ASSAULT PLANE DESIGNED FOR NAVAL USE

Shown here is a new utility assault aircraft proposed to the Navy by Douglas Aircraft Co. It has been designed specifically for fleet aerial resupply and Marine light assault missions. The 1906A model is powered by four Lycoming T-55 turboprop engines.

New Rocket Research Aircraft Being Developed by Air Force

The Air Force has announced progress in development of a new research aircraft known as the X-15. Wind tunnel tests are nearing completion, and fabrication of the rocket-powered research plane has begun at the Los Angeles plant of North American Aviation, Inc. Development of the X-15's liquid-propellant rocket engine is underway by Reaction Motors, Inc.

Although specifications are classified, the engine's thrust will be greater than the thrust rating of the Air Force X-1 and X-2 series aircraft. Air Force pilots have flown these planes at speeds of more than 1650 mph and altitudes of 90,000 ft or more.

Air Force Set to Replace Matador With New Version

The Air Force has announced that the Martin Matador ground-to-ground tactical missile presently in operational use is being replaced by a new, improved version of the missile. Designated the TM-61C, it will contribute powerfully to Air Force power.

The TM-61C incorporates a greatly improved guidance system, designed and developed by the Martin Co. Range of the Matador will be substantially increased.

The TM-61C is 39.6 ft long, 54 in. in diameter and has a wing span of 28.7 ft. Operating at speeds of more than 650 mph the missile is capable of altitudes over 35,000 ft.

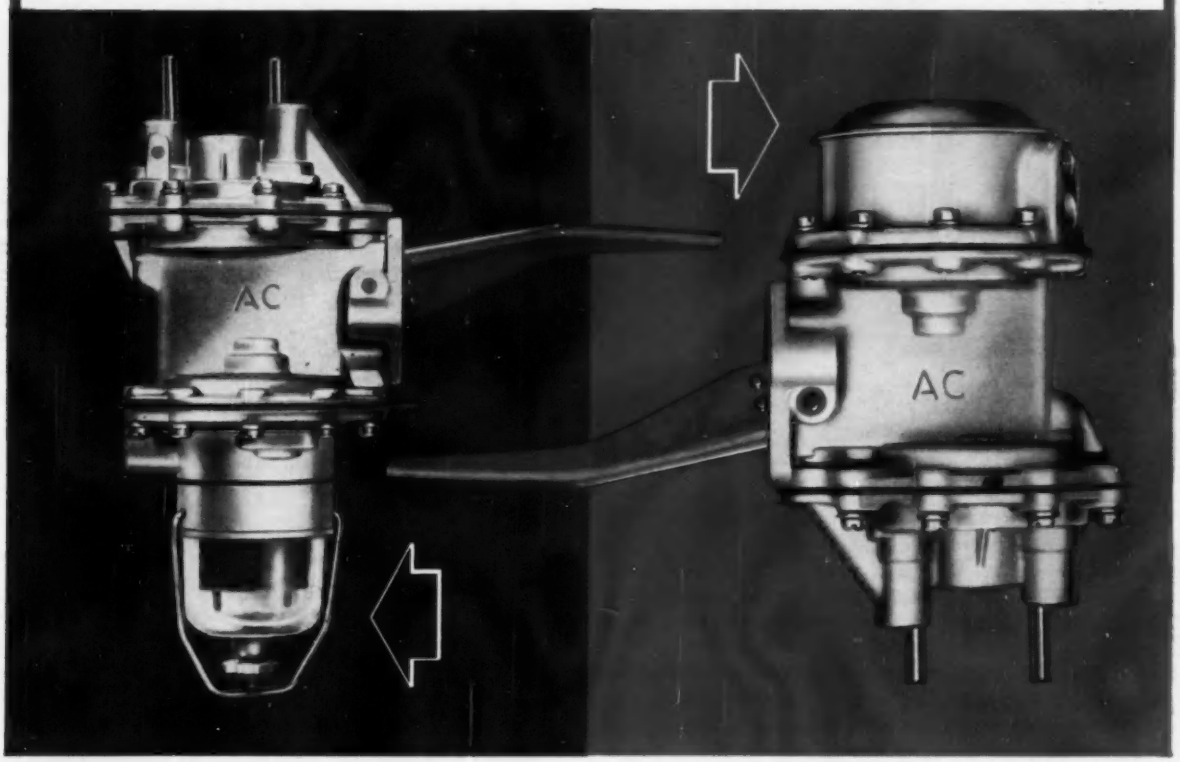
General Electric Awarded J79 Improvement Contract

A $5 million Air Force contract for the J79 jet engine program has been awarded the General Electric Co.'s Aircraft Gas Turbine Div.

The contract applies to a continuing improvement program for the J79. It powers the Convair B-58 Hustler, the Lockheed F-104A Starfighter, and the Grumman F11F-1F Tiger fighter.

ac puts the ac cent on service

How AC completely redesigned a fuel pump and had it in production in 63 days!



The problem was a tough one. A long-time user of AC Fuel Pumps made engine alterations just ahead of the new-car announcement period. Something had to be done . . . and done fast. The decision was to turn the pump upside down.

That decision turned AC upside down, too! Personnel worked seven days a week, around the clock! Sixty-three days later, the new "upside-down" pump was through design, production, engineering, scheduling, tooling, and production was rolling.

This is typical of AC service. Naturally we prefer more lead time, but this proves we have the know-how and the facilities to give real service on an emergency basis when required. If you have a problem that calls for service action, call AC!

What you have just read is one in a continuing series of FACTUAL SERVICE STORIES proving you can depend on AC for the facilities, the experience, the manpower and the desire to work with you in the solution of ordinary and extraordinary problems.

AC quality products

AC SPARK PLUG THE ELECTRONICS DIVISION OF GENERAL MOTORS

Flint—1300 North Dort Highway Chicago—Insurance Center Building Detroit—General Motors Building

AVIATION INDUSTRIES

Copyright 1957 by Chilton Company

By Ralph H. McClarren

Air Transport Facts and Figures, 1957

Entitled the 18th Edition, 1957, report prepared by the Air Transport Association of America, Washington, D. C., reflects a dramatic story of air transport progress. It is a statistical story of 19 years of continuous growth. A record of an industry ever increasing its public usefulness, as note chart below:

All Classes of Certified (U. S.) Air Carriers	1938	1956	Per Cent Increase
Number of Airlines	23	54	135
Cities Served	286[1]	713[1]	146
Airplanes in Service	345	1,726	400
Seats Available (Daily)	4,800	80,500	1,577
Cruising Speed—Fastest	220	360	64
No. of Passengers Carried	1,536,000	45,943,000	2,891
No. of People Employed	13,300	126,970[2]	855
Total Airline Payrolls	$27,396,000	$629,517,260	2,198
Air Mail Ton Miles	7,449	94,562,000	1,169
Average Fare per Mile[3]	5.32 C	5.28 C	—.8

[1] Includes International cities served and 10 Hawaiian cities. Does not include 12 Alaskan cities served in 1938 or 241 in such cities served in 1956.
[2] As of 6/30/56.
[3] Domestic Trunk Airline Fare.

Scheduled airlines of the United States today fly more than 61 per cent of the entire free world's air passenger traffic. It is a big industry. Gross income during 1956 was $1,856,231,000, an increase of 13.6 per cent over last year. Net operating income, however, was 7.2 per cent below 1955 income.

During the past year the industry, in preparing for the civil aviation jet age, has committed itself to add $2,600,000,000 worth of piston and new jet liners. And preparations are going ahead full tilt to provide adequate service, maintenance, overhaul and control of the jet aircraft coming into use by the airlines to assure a continued safe, convenient and faster service.

Growing—Private Flying

Today 65,000 privately owned aircraft are being flown 10 million miles annually by aproximately 200,000 pilots. This is three times the number of hours flown yearly by the airlines. By 1976 it is predicted that private flying for business (55 per cent), agriculture (25 per cent) and non-business (20 per cent) of general aviation flying will amount to 20 million hours yearly by about 90,000 aircraft.

Prediction was made by the General Aviation Facilities Planning Group (GAFPG) in a comprehensive report prepared for Edward P. Curtis, President Eisenhower's specical assistant for aviation facilities planning. GAFPG is composed of 11 member organizations whose activities relate to general aviation flying. It is headed by George E. Haddaway of Dallas, Texas, publisher of *Flight* magazine.

Planning for future aviation facilities including airports, air traffic control, air space allocation, hangars and service areas must definitely provide for the fast growing use of private aircraft combined with increased airline and military flying.

Doman Helicopter For Civil and Military Use

Doman Helicopters, Inc., of Danbury, Conn., invite you to see its newly CAA approved and licensed helicopter and see its operation and fly in it. The civil model number is LZ5-2, the U. S. Army and Air Force model is the YH-31. According to a brochure released by the company some of the characteristics of the helicopter are:

Seating Capacity	8
Cargo Compartment Area	34 sq ft
Cargo Compartment Volume	135 cu ft
Baggage Compartment Volume	20 cu ft
Engine, Lycoming SO-5BO-AIB	400 hp
Gross Weight	5,200 lb
Empty Weight	3,250 lb
Useful Load (standard)	1,950 lb
Useful Load (stripped)	2,250 lb
Maximum Continuous Speed	86 knots
Range with Maximum Gas (10% reserve)	330 nautical miles
Rate of Climb at Sea Level	850 fpm

Maintenance Hangar— 160 Ft Entrance Door

Under construction at Metropolitan Oakland International Airport is a hangar believed to be the largest free-span entrance building in the U. S. A column free span of 160 ft is available in the $1,250,000 aircraft maintenance hangar which when finished will be leased to Aircraft Engineering and Maintenance Co., a wholly owned subsidiary of the Transocean Corp. of Calif. The company does contract maintenance for Military Air Transport and the Air Force on both piston and jet engine aircraft.

Jets Power Airfield Catapult

A revolutionary new method of launching high-speed aircraft from short airfields, currently being operated by the U. S. Marine Corps, was recently introduced at All American Engineering Company's test facilities in Georgetown, Del., when its new and spectacular turbo-catapult launched jet aircraft from the world's first turbine powered catapult.

In a series of tests before U. S. Navy Bureau of Aeronautics observers, the Navy aircraft, boosted by

(*Turn to page* 190, *please*)

BENDIX OFFERS A COMPLETELY MODERN INDUSTRIAL ENGINE MAGNETO

UNMATCHED DESIGN FEATURES

- Metal Encased
- Fully Ball Bearing Equipped
- Pivotless Aircraft Type Breaker
- Impulse Coupling Provides for Complete Adjustment of Lag Angle and Lug Position
- High Output at all Operating Speeds
- Metal High Tension Outlet Plate and Feed-through Condenser on Shielded Magnetos

The reputation of Bendix* in the field of ignition is truly unmatched. From the history-making flight of Lindbergh to today's fastest jets, the aviation industry has always looked to Bendix for the latest and most efficient ignition equipment. Likewise in industrial ignition Bendix has set new standards of performance in applications ranging from small outboard motors to the largest industrial engines.

That's why the introduction of this new Bendix S-400 series of magnetos is of such great importance. Here is a magneto that incorporates all of the improvements and refinements of modern ignition design.

Built to aircraft precision standards the new S-400 series is especially rugged so as to deliver trouble-free operation during long periods of service.

It is available in both four- and six-cylinder flange-mounted models in weatherproof, unshielded and radio-shielded versions.

For the important jobs where continuous top performance is a must, the new Bendix S-400 series magneto is the logical choice. Why not write today for complete details and specifications of this modern industrial engine magneto.

SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION, SIDNEY, N. Y.
Export Sales and Service: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

*TRADEMARK

Scintilla Division
SIDNEY, N. Y.

Bendix
AVIATION CORPORATION

The BUSINESS PULSE

Recent Developments Indicate that Business Levels Will Be Maintained in the Near Future, But No Sharp Rise in Activity Is Foreseen for the Months Immediately Ahead. Governmental Spending Upped by Highway Construction.

This Survey Is Prepared exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York

Little Change in Business Activity

The business picture is showing very little change. Such aggregate measures of activity as industrial production, retail trade, and employment held steady in March at levels approximating those of the earlier part of the year, and more or less the same situation seems to have prevailed through April.

This stability has been reassuring to the business community, which in the early part of the year had been given some cause for concern by a rather broad range of unfavorable developments. Now confidence seems stronger. Stock prices have made a rather impressive recovery, with the Dow-Jones industrial average climbing well above its February low. Bond prices have eased off significantly, indicating that bond buyers are thinking in terms of high business levels accompanied by comparatively high interest rates.

Price patterns have also reinforced the impression that a firm business situation is emerging. Earlier this year the so-called sensitive price indices were tending lower, reflecting weakness in primary markets, but recently these have stabilized. Furthermore, consumer prices continue their seemingly inexorable upward tendency, the movement tending to perpetuate itself by the operation of so-called escalator clauses in many union contracts.

But if these recent developments seem to justify increased confidence that business levels will be well maintained over the near term, they do not provide much encouragement for the belief that activity will rise sharply in the months immediately ahead. This is because there has been no indication that latent strength is developing in sectors sufficiently important to generate a broad upswing. The latest report of the National Association of Purchasing Agents, for example, noted that there was little evidence of any real spring upturn this year, and that experience was sufficiently disappointing to create a "faint but audible blue note."

New Car Sales

Certainly one of the principal disappointments to date has been the failure of new-car sales to register the hoped-for spring upsurge. There were some signs towards the end of March that a boomlet was developing, but the movement was not sustained, and in the first 20 days of April the daily rate of sales slipped below year-earlier levels. The tendency among informed observers is now toward less optimistic expectations than were characteristic several months ago. Arthur O. Dietz, president of C.I.T. Financial Corp., recently observed that he expects car sales this year to be "approximately the same as 1956—probably a little greater, perhaps a little less."

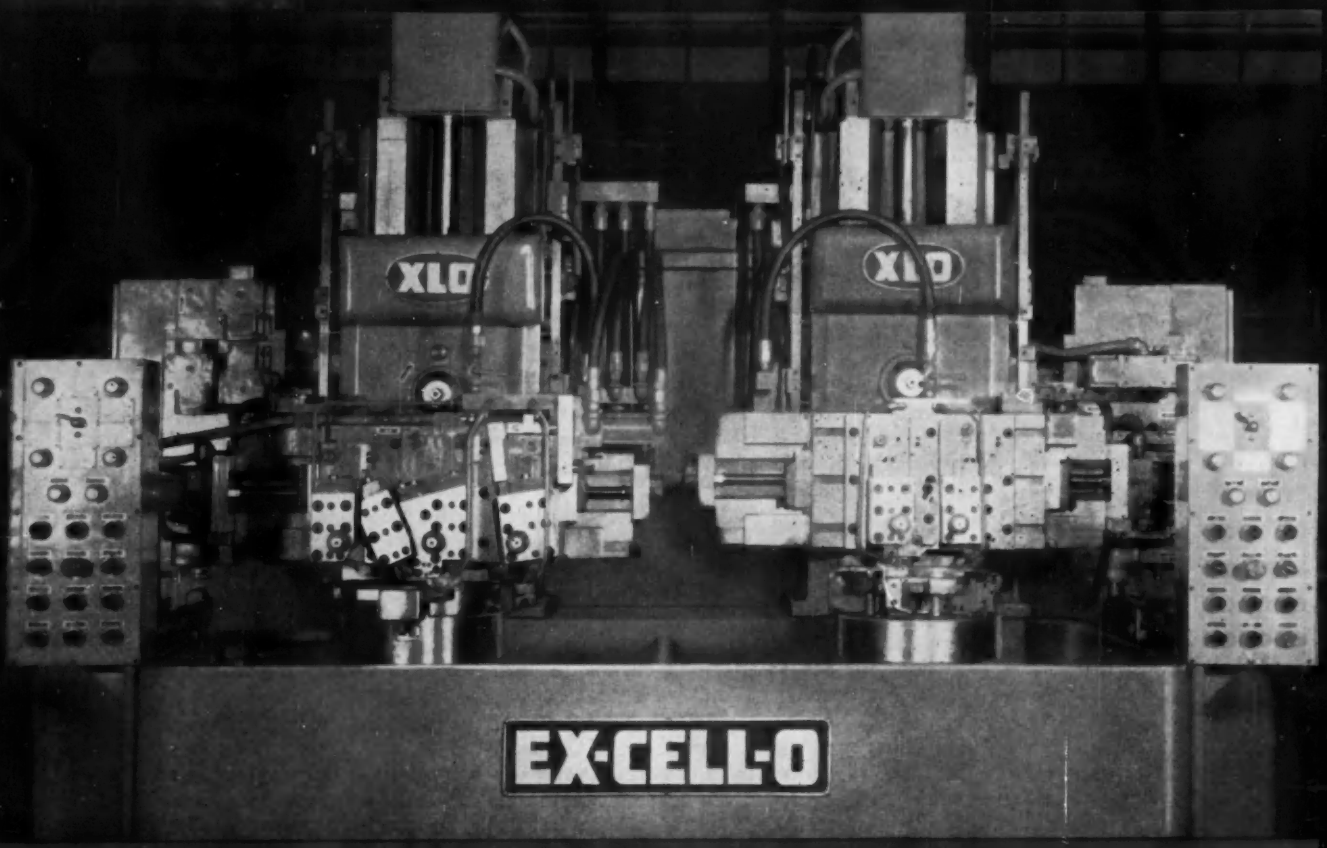
Moreover, the downtrend in new housing starts has not been arrested as yet, or at least it had not been through March, the latest month for which information is available. Thus, there is little basis for counting on this sector to impart much stimulus to general activity in the near future. Recovery here could conceivably occur as soon as credit conditions ease, since majority judgment seems to hold that there is no dearth of potential demand. With money-market conditions as tight as they are, however, it is difficult to see how revival could come before the second half of the year.

Plant Expenditures Level Out

The recent tendency for plant and equipment expenditures to level out would suggest that little or no net stimulus can be expected from this area in the months immediately ahead. With the profits picture still very spotty—earning reports for the first quarter were decidedly mixed—the most that can be hoped for, probably is a reasonably well-maintained level of expenditures.

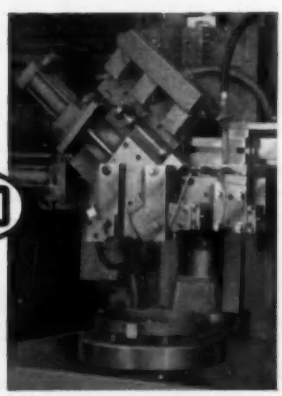
Outlays by Governmental bodies — Federal, State, and local — have been in a moderate uptrend recently, and it appears likely that this pattern will persist, helped along by the acceleration of highway expenditures, among other things. So far, however, strength in this sector has done no more than compensate for weakness in other areas, and there can be no assurance that the situation will be essentially different later this year. There is some basis for arguing

(*Turn to page* 130, *please*)



Twin spindles Double work capacity

This arrangement uses a magnetic chuck to hold an automotive part for processing.



XLO

EX-CELL-O FOR PRECISION

The Style 432 machine as fitted with an auxiliary slide for angular cuts.

A single operator on this Ex-Cell-O Vertical can precision turn, bore, face, groove and chamfer two identical or completely different workpieces simultaneously. All operations may be performed singly or in combination, and don't overlook the loading ease and tool accessibility of this vertical boring machine.

Ex-Cell-O engineers have cut maintenance time to barest minimum by locating service parts within easy reach. Yet overall design of this machine is clean and compact.

No doubt you are interested in increasing your production output. Call your nearby Ex-Cell-O representative for a conference today. His suggestions cost you nothing—and may save you a considerable sum. Or get in touch with Ex-Cell-O in Detroit directly. We would appreciate the opportunity of putting our years of specialized experience in the machine tool field at your disposal.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

57-20

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING & BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS & BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT & MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

VOLATILITY OF GASOLINE

— a Problem for Refiners and Engine Designers —

Pros and cons of gasoline volatility were discussed at an off-record session of the National Petroleum Association last month in Cleveland. This subject is considered so contraversial that only a summary of the proceedings, without mention of participants, was approved for publication in this issue of AI.

Volatility has many facets, and fuel today at the service station pumps is the best compromise that can be made between refining economics on the one hand and the requirements of modern engines on the other.

High volatility stems from the use of butane. This appears to be the lowest cost ingredient that enables refiners to meet the growing demand for high octane values in current V-8's and the new engines that are on the way. In this respect butane is an aid in reaching octane values up to 104.

At this point we find the dilemma. Butane is not only the most economical addition to gasoline stocks but is also invaluable in obtaining good warm-up characteristics. On the other hand, the potential hazard of vapor lock automatically sets a limit on volatility.

One refiner, analyzing user complaints over the past 10 years, finds that vapor lock has become less troublesome. His big problem currently is in performance characteristics — mainly warm-up and acceleration.

All of the major refiners are employing modern methods of statistical analysis in large samples of the car population to determine what range of volatility is acceptable to most cars on the road. The general conclusion appears to be that volatility is on the increase and that Reid vapor pressure is slowly increasing. There seemed to be general agreement that each refiner has had to decide what percentage of the car population in his marketing area could be handled acceptably with the volatility values established for his gasolines.

In the face of refinery economics engine designers—represented by one major car producer—are looking for a change in the volatility picture. Specifically they urge a move to much more conservative volatility ratings.

According to one expert the real test of volatility is found in the sensitivity of the modern, introcate carburetors and their ability to handle vapor. Volatility is too high both winter and summer to suit automobile engineers. The big headache is a frothy mixture of vapor and liquid.

It was mentioned earlier that refiners feel that vapor lock is not a serious problem, at least they believe we can live with it. The analysis made by the automobile representative proved that if the problem is not serious that is only because modern carburetors have been deliberately designed to expel most of the vapor and butane through venting of float chambers and around the throttle. The number of vents thus employed varies with each make and model. They range from 5, 6, and 7 vents on some; and up to 14 vents in one specific case.

Thus the carburetor is arranged to tolerate high volatility and high Reid vapor pressure only by expelling the vapors. While this reduces vapor lock materially it means a loss in economy.

In the face of projections indicating that both volatility and Reid vapor pressure are going up, underhood conditions are seen worsening for the future. Hood lines are trending lower; engine displacement and output are going higher; and more power absorbing devices are being contemplated. All of these things add up to higher under-hood temperatures and increasingly less tolerance of high voltatility fuels.

Hence engine designers are pleading for more conservative volatility ratings. One way out may be through the adoption of solid fuel injection as this type of system becomes more popular and less costly.

• • •

Storage Battery Usage Of Lead to Soar in '57

B. B. Steiner, president of the Association of American Battery Manufacturers, Inc., predicts that 387,000 tons of lead will be used in storage batteries in 1957. This is an increase over the 366,000 tons used last year.

It is based on an estimated production of 34.983 million automotive-type batteries, with 35,000 tons of lead used for industrial type batteries. The estimate for automotive type batteries is an increase of a little more than two million over 1956.

Mr. Steiner stated that data gathered by his Association indicate that the average life of automobile batteries has been as low as 16.3 months and as high as 27.6 months since 1940 with the longest life prevailing in 1956. He placed the average automobile battery weight at 20.11 lb.

In discussing the trend toward 12-volt rather than 6-volt batteries in automobiles, he stated that all new passenger cars, with the exception of the Willys Jeep, are now equipped with 12-volt batteries.

On the basis of total registrations 12-volt batteries have increased from 0.7 per cent in 1953 to 9.2 per cent in 1956.

STAINLESS STEEL MAKES THE DIFFERENCE

...its effect on modern styling

Clean lines. A crisp, new look. More functional. Lasting beauty. These are some of the effects modern designers gain with stainless steel—why they use more and more stainless steel every year in cars as well as appliances, housewares, furniture and houses.

To marketers, stainless steel combines the smart selling values of beauty and easy maintenance with the hard selling values of superior corrosion resistance, durability and toughness.

Stainless steel is available in countless work-saving standard shapes. It's readily machined, formed, joined, or cast.

For more facts about stainless steel and the contribution it can make to your product or marketing problems, see your stainless steel supplier or write ELECTROMET—leading producer of more than 100 alloys for the metal industries, including chromium and manganese used for making stainless steels.

ELECTRO METALLURGICAL COMPANY
A Division of
Union Carbide and Carbon Corporation
30 E. 42nd Street UCC New York 17, N. Y.

METALS DO MORE ALL THE TIME ...THANKS TO ALLOYS

Electromet
Trade-mark

Stainless steel styling . . . first to catch the eye and quickest to capture the heart of the consumer. It combines beauty with hardness and strength to resist denting and scratching—and rust is never a problem.

• • INDUSTRY STATISTICS • •

1957 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending May 4	Weeks Ending April 27	Total—Year to Date 1957	Total—Year to Date 1956
PASSENGER CAR PRODUCTION				
Hudson	38	53	1,005	3,905
Nash	154	133	2,343	10,279
Rambler	2,135	2,112	32,947	37,072
Total—American Motors	2,327	2,298	36,295	51,257
Chrysler	2,498	2,992	51,270	47,907
De Soto	2,970	2,427	57,182	43,814
Dodge	5,796	6,405	116,328	75,389
Imperial	901	1,144	16,846	*
Plymouth	12,506	14,861	256,419	184,401
Total—Chrysler Corp.	24,671	27,829	498,045	351,511
Ford	29,732	29,346	579,287	505,394
Lincoln and Continental	492	858	18,439	21,901
Mercury	5,566	6,756	131,797	98,622
Total—Ford Motor Company	35,790	36,960	729,433	625,917
Buick	8,500	8,407	184,378	250,312
Cadillac	3,770	2,974	59,486	60,119
Chevrolet	29,753	28,786	554,817	651,047
Oldsmobile	7,312	8,416	171,260	194,189
Pontiac	6,644	6,767	149,338	148,571
Total—General Motors Corp.	55,979	55,350	1,119,291	1,304,238
Packard	106	133	5,892	9,786
Studebaker	1,119	1,047	21,712	39,160
Total—Studebaker-Packard Corp.	1,225	1,180	27,604	48,946
Checker Cab	140	107	1,624	940
Total—Passenger Cars	120,132	123,724	2,412,292	2,382,809
TRUCK PRODUCTION				
Chevrolet	7,442	6,831	130,312	145,111
G.M.C.	1,206	1,532	26,026	37,570
Diamond T	119	111	1,563	1,749
Divco	88	80	1,333	1,560
Dodge and Fargo	1,776	1,818	30,884	31,444
Ford	8,212	9,063	127,219	114,232
F.W.D.	16	19	391	755
International	2,687	2,761	35,586	53,333
Mack	329	334	6,226	6,694
Reo	67	53	1,100	1,312
Studebaker	259	214	4,288	5,704
White	314	316	5,919	6,938
Willys	1,137	1,351	22,062	22,159
Other Trucks	92	91	1,608	2,297
Total—Trucks	23,754	24,574	394,287	430,858
Buses	116	127	1,534	1,502
Total—Motor Vehicles	144,002	148,425	2,808,113	2,815,169

*—Included with Chrysler.

1957 TRUCK TRAILER SHIPMENTS

Type of Trailer	February	January*	Two Months
Vans			
Insulated and refrigerated	435	262	697
Steel	69	51	120
Aluminum	366	211	577
Semi-insulated	68	88	156
Steel	16	9	25
Aluminum	52	79	131
Furniture	168	168	335
Steel	159	163	322
Aluminum	7	6	13
All other closed-top	1,816	1,812	3,628
Steel	919	860	1,779
Aluminum	897	952	1,849
Open-top	323	323	646
Steel	162	187	349
Aluminum	161	136	297
Total—Vans	2,808	2,654	5,462
Tanks			
Petroleum	451	413	864
All other	93	114	207
Total—Tanks	544	527	1,071
Pole, pipe, and logging			
Single axle	33	30	63
Tandem axle	38	54	92
Total	71	84	155
Platforms			
Racks, livestock and stake	40	62	102
Grain bodies	166	127	293
Flats, all types	706	595	1,301
Total—Platforms	912	784	1,696
Low-bed heavy haulers	238	208	446
Dump trailers	150	174	324
All other trailers	225	284	509
Total—Complete Trailers	4,948	4,715	9,663
Chassis	259	249	508
Total—Trailers and Chassis	5,207	4,964	10,171

*—Revised. Source—Industry Div., Bureau of the Census.

1957 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

Month	6,000 lb and less	6,001–10,000 lb	10,001–14,000 lb	14,001–16,000 lb	16,001–19,500 lb	19,501–26,000 lb	26,001–33,000 lb	Over 33,000 lb	Total
January	46,186	11,843	2,399	12,478	6,386	3,560	3,360	2,893	91,117
February	45,516	13,537	3,289	13,921	4,994	3,988	3,436	3,086	91,767
March	45,873	13,616	3,469	13,035	5,117	3,985	3,502	3,106	91,703
Total—3 Mos. 1957	139,575	38,996	9,157	39,434	16,509	11,533	10,298	9,085	274,587
Total—3 Mos. 1956	129,690*	82,854*	10,913	57,250	19,049	16,632	21,343	**	307,731

*—Prior to Jan. 1957 vehicles below 10,001 G.V.W. were grouped "5,000 & less" and "5,001-10,000 lb."
**—Included with 26,001-33,000 group.

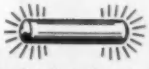
REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	February 1957	January 1957	February 1956	Two Months 1957	Two Months 1956	Per Cent Change: Feb. over January	Feb. over Feb. 1956	Two Months 1957 over 1956
1	New England	20,863	19,586	26,115	40,449	48,249	+ 6.73	−20.03	−16.17
2	Middle Atlantic	69,046	64,894	70,644	133,940	130,507	+ 6.40	− 2.26	+ 2.63
3	South Atlantic	60,569	63,373	58,363	123,942	120,609	− 4.42	+ 3.76	+ 2.76
4	East North Central	115,404	113,295	115,668	228,699	230,789	+ 1.86	− .23	− .90
5	East South Central	23,225	20,945	25,850	44,170	469,959	+10.89	−10.15	− 5.94
6	West North Central	36,107	38,687	41,179	74,794	78,425	− 6.67	−12.32	− 4.63
7	West South Central	44,735	47,242	48,786	91,977	88,385	− 5.31	− 8.30	+ 4.06
8	Mountain	15,558	13,830	14,393	29,358	27,951	+12.74	+ 8.09	+ 5.03
9	Pacific	53,190	55,518	46,546	108,716	107,336	− 4.18	+14.29	+ 1.29
	Total—United States	438,725	437,320	447,542	876,045	879,190	+ .32	− 1.97	− .36

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.

Full complement of small diameter rollers insures maximum number of contact lines in load zone for high radial capacity in minimum space.

Mounted without races between hardened shaft and hardened housing (RC-60 recommended), Torrington Needle Rollers allow largest possible shaft diameters.



Carefully hardened, ground and lapped high carbon chrome steel makes each Torrington Needle Roller a precision part for long life performance.

Close tolerances are assured by stringent quality controls. Standard OD tolerance is .0002", but Torrington Needle Rollers can be supplied with tolerance of .00005". Tolerance on length depends on end shape.

Fine finish reduces friction to a minimum. Torrington Needle Rollers are usually polished to 4-6 rms, but finishes as fine as 1-3 are available on special order.

Now you can get highest capacity at lowest cost with Torrington Needle Rollers

A hardened shaft, a hardened housing, and precision Torrington Needle Rollers provide the most economical, highest capacity anti-friction assembly you can obtain.

Six roller end shapes permit design flexibility whether the requirement be maximum effective roller length, proper fillet clearances or greater lip retainment. Torrington Needle Rollers are available in a complete line meeting SAE and AFBMA specifications. Torrington standards for material, heat treat, tolerance and finish of Needle Rollers are the highest in the industry.

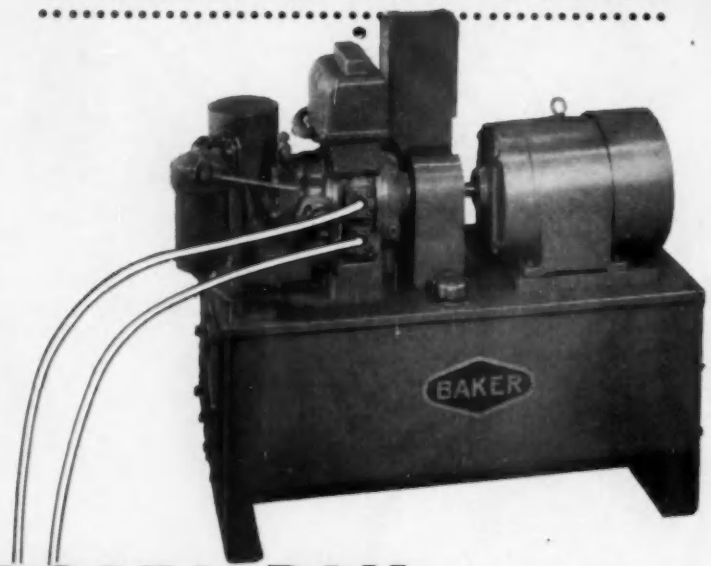
Operating results with Needle Rollers depend on careful design of mating parts. Torrington's Engineering Department, with extensive experience in Needle Roller application, will be glad to give you technical advice on your needs. *The Torrington Company,* Torrington, Conn.—and South Bend 21, Ind.

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

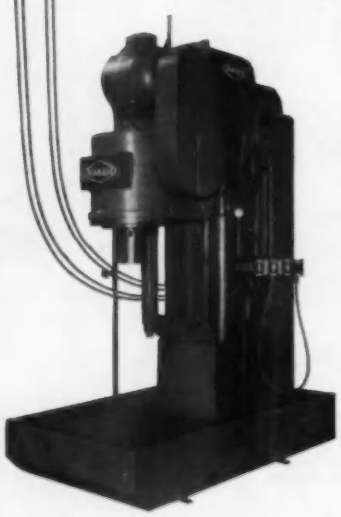
NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • BALL • NEEDLE ROLLERS • THRUST

another BAKER bonus



PORTA-PAK

. . . SERVICE IS A SNAP



Here's a *separate* hydraulic power source that's attached to the machine only through the hydraulic lines. So it can be placed in any convenient location . . . and it's always easily accessible for service. A completely self-contained unit. Porta-Pak can be furnished on all Baker specials — or on Baker Basics, for automation with *standard* machines.

BAKER

AUTOMATION

Best in the long run
Practical in the short run

CHECK AND MAIL FOR DATA

( ) Porta-Pak hydraulic power source
( ) Exclusive twin-pull hydraulic feed cylinders — compact, easily accessible.
( ) Hardened, ground steel or cast iron ways — durable
( ) Big ball bearings throughout, rugged construction

BAKER BROTHERS, INC.
Dept. AI-557, Toledo 10, Ohio

Yes, tell me more about these Baker Bonuses.

NAME AND TITLE

COMPANY

ADDRESS

CITY ZONE STATE

SHORTIES

The value of all the machinery on U. S. farms, including motor vehicles, has reached the staggering sum of $17.7 billion.

●

A farmer of today produces enough to feed 25 persons. The farmer of 1910 produced only enough to feed eight, or, figuratively, 25 persons buy their food from one farmer today, whereas only eight did in 1910.

●

Motor vehicle production increased more than 110 per cent as population grew about 27 per cent between 1939 and 1955.

●

In 1914, an automobile cost 2763 hours of work, but only 954 in 1948.

●

Improved drilling equipment and techniques enable oil men to drill wells over nine times as fast today as they did 30 years ago.

●

The average life of a motor vehicle has increased from six years in 1925 to a present all-time high of more than 13 years. Total mileage accumulated during an average vehicle's lifetime has quadrupled since 1925, rising from 25,750 miles to 115,000.

●

Motor vehicle users in the U. S. pay more than $7.3 billion annually in state registration and gasoline taxes, special city and county taxes, and road, bridge, tunnel and ferry tolls. Nearly $2 billion of the total is paid by truck users.

●

Powered by four turboprop engines developing a total of 24,000 hp, a new military transport being produced by a U.S. manufacturer carries a 100,000-lb payload. Its fuel load alone is more than eight times the weight of a transport the same company manufactured 30 years ago.

●

The Government spends 50 cents out of every dollar it takes in on military security.

FRAM

Carburetor Air Filters feature this patented built-in gasket

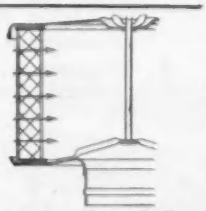
THIS FRAM PATENTED DESIGN absolutely prevents by-passing of dirty air: eliminates all the defects found in other types of sealing such as—metal to metal, metal to cork or compound gaskets and metal beads pressed against a flat plastisol face. All of these leak dust and dirt unless the cartridge is replaced after servicing, in *exactly* the same position.

To achieve absolute protection against by-passing, the top and bottom facings of the cartridge must form a perfect seal with the air cleaner housing even after removal for cleaning and replacement afterwards. To accomplish this, FRAM engineers designed the exclusive FRAM patented built-in gasket as an *integral* part of the end seal. Once locked in place under slight pressure, this built-in gasket provides an absolute bond with the housing case. No matter how often the cartridge is serviced, the unit is *always perfectly sealed. It can never leak dirty air!*

Only FRAM can offer the automotive industry this exclusive FRAM feature that means thousands of carefree motoring miles with *no* danger of engine-killing dust and dirt! Add these other exclusive FRAM advantages: 99.+% efficiency, and easy installation and you'll know why the FRAM *Filtronic* Carburetor Air Filter Cartridge is the finest on the market.

A FRAM representative will be happy to give you full details including research information. If you have a filter problem, drop a line today to FRAM CORPORATION, Providence 16, R. I., or FRAM CANADA LTD., Stratford, Ontario.

FRAM patented built-in gasket forms a perfect air-tight seal



All air must pass through the filtering material

ALREADY STANDARD EQUIPMENT ON THESE 1957 ENGINES

Continental • Ford • Lincoln • Mercury • Thunderbird • Turnpike Cruiser • Packard • Studebaker • American La France • Autocar Clark • Cummins • Diamond T • Divco • Continental Motors General Supply • Harley Davidson • Lycoming • Reo • Sheppard

FRAM offers a complete line of replacements for other cars equipped with a "Filtronic" type carburetor air filter: • Imperial • Chrysler Dodge • De Soto • Plymouth

"FAIRFIELD for FINE GEARS"

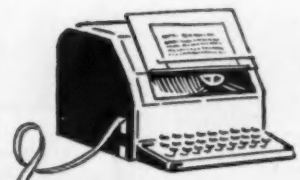
WHAT **FAIRFIELD**
Facilities CAN MEAN TO YOU

1. **MASS PRODUCTION ECONOMY**—Large or small, you get the benefits of high production rates and big volume output at Fairfield—where fine gears are produced to meet your specifications EFFICIENTLY, ECONOMICALLY!
2. **QUALITY PLUS**—There is no finer recommendation for the quality of the product you sell than to be able to say it is "EQUIPPED WITH FAIRFIELD GEARS!"
3. **DEPENDABLE SOURCE OF SUPPLY**—Fairfield is one of America's largest independent producers of precision-made, automotive type gears for leading builders of construction, agricultural, industrial, marine, and automotive equipment.
4. **BACKED BY EXPERIENCE**—Unexcelled facilities in an ultramodern plant backed by more than thirty-five years' experience in producing Spur, Herringbone, Spiral Bevel, Straight Bevel, Hypoid, Zerol, Worms and Worm Gears, Splined Shafts, and Differentials to customer's specifications.
5. **ENGINEERING SERVICE**—Fairfield engineers are qualified to make expert recommendations on your gear production requirements. *Your inquiry will receive prompt attention.*

FAIRFIELD
MANUFACTURING CO.

2303 S. Concord Rd. — Lafayette, Indiana

For FINE GEARS



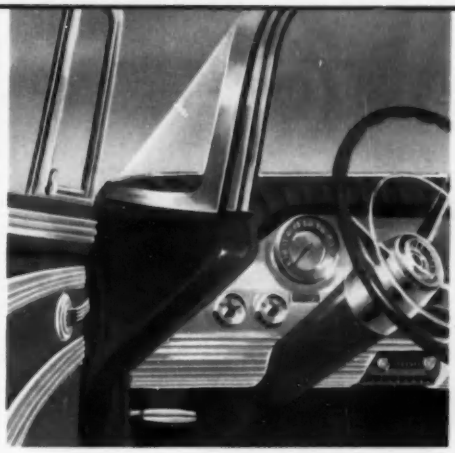
ON OUR WASHINGTON WIRE

Overall business activity has continued high in the recent period, Commerce Dept. reports. Personal income in the U.S. continued to rise throughout the first quarter of this year to attain an annual rate of $337½ billion in March. This was up nearly $4 billion from the last quarter of 1956 and $19 billion, or six per cent, from March a year ago. Seasonally adjusted sales in manufacturing and trade totaled $56½ billion in both January and February—up nearly $1 billion from the fourth quarter, although the increase mostly reflected higher prices.

Fewer machine tools owned by the Air Force will sit idle in warehouses. The trend away from buying equipment for storage is clearly marked now. As the latest-type tools are bought, increasing numbers are placed with contractors for current use. Present forecast is that 80 per cent of the Air Force equipment inventory will be in operation by mid-1959.

Cash dividend payments by corporations issuing public reports reached a total of $2.8 billion in the first quarter of 1957, Commerce Dept. discloses. This figure was 2½ per cent higher than that for the same quarter last year.

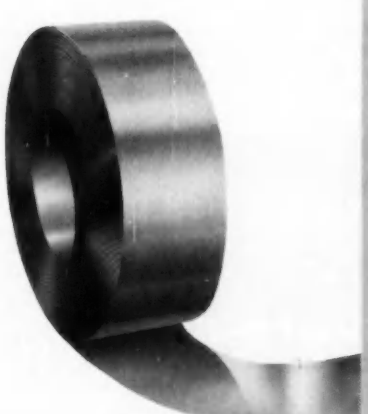
Traffic safety groups caution Congress on the growing problem of preventing motor vehicle accidents. National Safety Council and American Bar Association spokesmen predict 82 million cars will travel 825 billion miles in 1966. In that year, if accident rates are not cut, 54,000 people will die in traffic mishaps. Another 1.9 million persons will be injured. Personal injury and property damage losses will amount to $6.3 billion.



indoors or out—
the accent is STAINLESS
the meaning is PROFIT

mouldings of Superior Stainless

STRIP STEEL



The bright world of applications for mouldings of Superior Stainless tells the story fast: *wherever these mouldings are used, profit is part of the picture!* Profit in fabrication, through Superior's uniform ease of working . . . profit in sales, from outstanding value appeal . . . profit in customer satisfaction, which builds more business! ● Let us send you the Superior Stainless Strip Steel Brochure.

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

air-conditioned cover keeps new clutch c-o-o-l

Frictional heat has little effect on the new *Lipe* Direct Pressure Clutch. Air circulating through the cover's 33 ventilating holes dissipates heat rapidly. The result is a heavy-duty clutch singularly free of burned facings and warped pressure plates. A clutch whose low maintenance cost matches its low first cost.

Lipe Direct Pressure Clutches now available: 13", 14", 15" single-plate, 14" and 15" two-plate. Send for complete information.

For the name of your nearest Authorized Lipe Distributor, look under "Clutches" in your telephone directory. Or, write us.

Manufacturers of Automotive Clutches & Machine Tools

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N. Y.

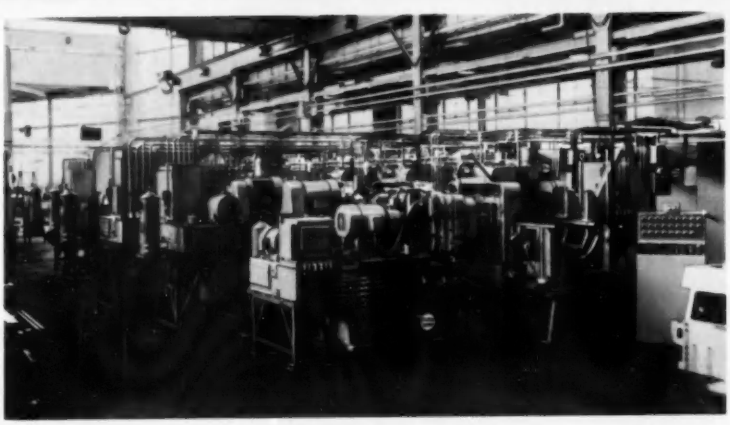
CORPORATION
CARNEGIE, PENNSYLVANIA

Another Manufacturer Chooses G-E Control For Automotive Industry Machines

W.F. & JOHN BARNES

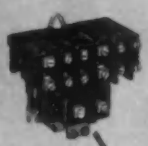
The panel above is part of a control system containing 356 General Electric machine tool relays and 46 G-E motor starters. These G-E devices help control the operation of an automobile cylinder block transfer drilling and tapping machine built by W. F. & John Barnes Company of Rockford, Illinois. This machine will be installed at the Ford Motor Company's Cleveland, Ohio Engine Plant.

Speaking of the panel, Nelson P. Bashor, Director of Electrical Controls, W. F. & John Barnes Company, says, "We recognize the product leadership that has been established by the General Electric machine tool relay. We are proud to use it in our electrical control panels, and are confident that our customers will obtain the best operation from this equipment."



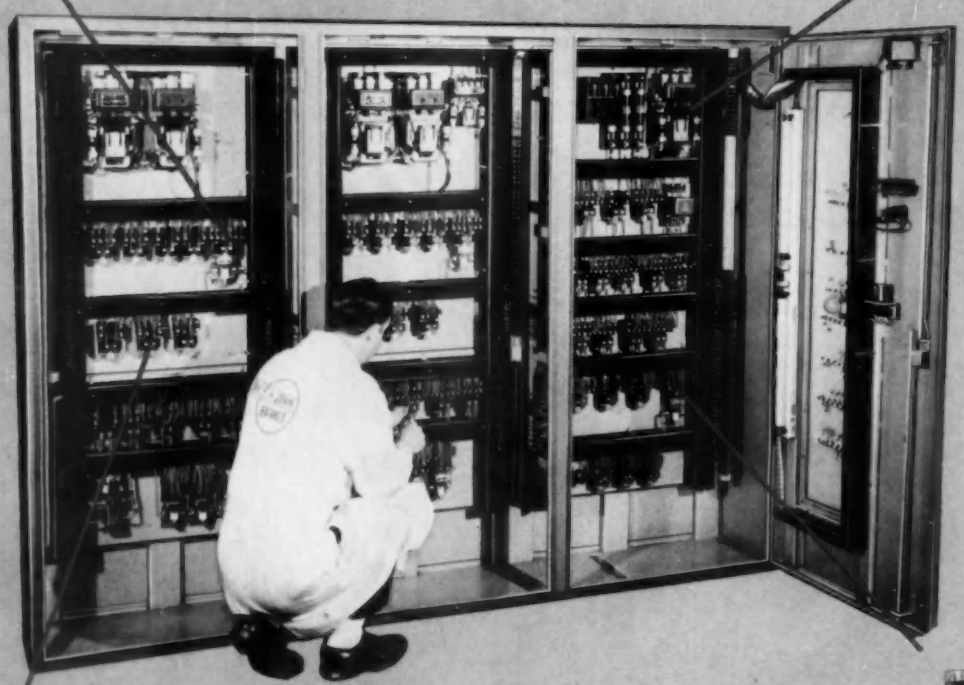
This machine, consisting of 33 sectional progress stations, performs numerous drilling and reaming operations and can handle 103 automobile cylinder blocks an hour. For a more detailed description of General Electric control devices used by W. F. & John Barnes Company in the control panel for this machine, turn the page.

GENERAL ELECTRIC



6-POLE IN-LINE machine tool relays save space because they can be mounted closer together and have front accessibility.

MAGNETIC STARTERS are offered in NEMA Sizes 0–5, have bi-metallic overload relays for dependable overload protection.

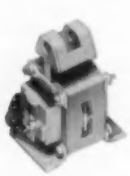


MACHINE TOOL RELAYS have Strongbox coils and fine silver contacts for longer life. Available in 2- through 12-pole forms.

LATCHED-IN RELAYS compact and easy to wire provide continuity of sequencing in case of voltage dip or power interruption.

G-E Controls for the Automotive Industry

OIL-TIGHT PUSH BUTTONS feature self-a-line contacts that last twice as long by actual load-life tests. They are offered in a wide variety of interchangeable operators.



STRONGBOX SOLENOIDS have coils sealed against the entrance of oil, dust, and moisture. They are available in a full range of ratings in both push and pull forms.

PNEUMATIC TIME-DELAY RELAY has range of settings from 0.2 to 180 seconds. It can be changed from on delay to off delay without additional parts or special tools.

W. F. & John Barnes Company selected General Electric machine tool relays and motor starters for three reasons: 1) ease of installation; 2) high operating efficiency; 3) dependable operation. These G-E controls are built to JIC Standards, and are designed for the rugged service required for automotive applications.

Whether for use on machines in your own plant or on equipment bought from suppliers, specify General Electric control. Your nearest General Electric Apparatus Sales Office or Distributor has full information for you. For a copy of GEA-6317, "G-E Control for JIC Standards," write to Advertising Section 733-36, General Electric Company, Bloomington, Ill.

GENERAL ELECTRIC

GENERAL ELECTRIC

Design Changes

(*Continued from page* 49)

under all operating conditions.

In the General Motors group development has been encouraged along two entirely different avenues. On the one hand is the HydraMatic drive (Cadillac, Olds, Pontiac); on the other hand are the torque converter drives used by Chevrolet and Buick. This year Chevrolet emerged with its Turboglide in which progressive changes are made smoothly from acceleration to direct drive conditions through the medium of a triple-turbine configuration. This marks an interesting development in torque converter design. We are quite confident that another GM division will come out with a radical type of torque converter drive for its 1958 models.

Adoption of pushbutton control of transmission gear selection by Packard and Chrysler in 1956 created a break from the traditional stick control. It has many attractive features from the standpoint of control mechanism simplification and ease of handling. Whether or not this will be adopted by makes other than those using it this year is a matter for conjecture.

SUSPENSIONS—For a number of years the industry concentrated its major efforts on automatic transmissions and engines. This year saw the emphasis shift to the suspension system. Except for the torsion bar system introduced by Packard in 1956 there have been no striking changes for almost 20 years. This year Chrysler adopted the TorsionAire ride for all divisions, featuring torsion bars at the front end.

At the same time Cadillac cracked the barrier by fitting the Eldorado Brougham with air ride suspension, employing air domes in which air is compressed by means of a diaphragm to give a soft, smooth ride.

While it is quite certain that suspensions will undergo considerable change in 1958 models, only the individual producers know whether they will shift to one type or the other. We do hear that one or more producers intend to employ air suspension for 1958.

The suspension system, particularly at the front, has been subjected to many refinements in recent years. Perhaps the most significant was the across-the-board adoption of ball joints at the front end. This has simplified the mounting as well as the component parts, has reduced friction materially, and has eliminated a large number of lubrication points.

While on the subject of suspensions, attention is drawn to the so-called air cushion rear suspension used on most models in the Mercury line. This consists of an air cushion analagous to a 6-in. x 1½-in. tire, held at atmospheric pressure, inserted between the frame and the rear spring front eye. It absorbs driving and braking forces as well as jounces and bumps.

ENGINES — Engine developments have been covered throughly in AI. At this point we aim at singling out some striking new developments that bear watching. Consider the induction system. The

To connect a Hansen Two-Way Shut-Off Coupling, you merely pull back the sleeve and push the Plug into the Socket. To disconnect, just pull back the sleeve. No tools required. When Coupling is disconnected, similar valves in Socket and Plug shut off both ends of line—practically eliminate spilling of liquid or escape of gas at instant of disconnection.

Hansen Series HK Two-Way Shut-Off Couplings are available with female pipe thread connections from ⅛" to 1" inclusive. Available in brass or steel. Sizes generally required for L-P Gas service have approval of Underwriters' Laboratories.

WRITE FOR THE HANSEN CATALOG

Here's an always ready reference when you want information on couplings in a hurry. Lists complete range of sizes of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight-Through Couplings—including Special Service Couplings for Steam, Oxygen, Acetylene, etc.

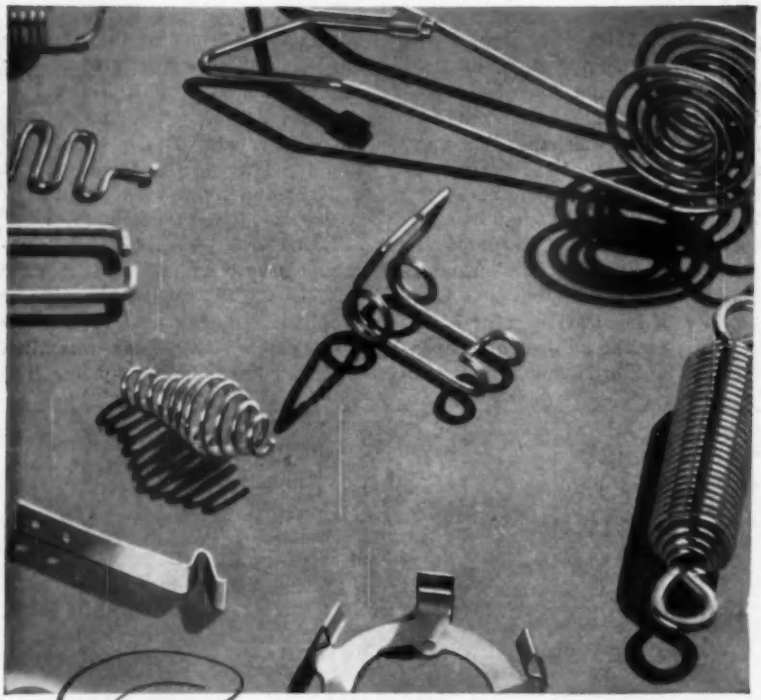
REPRESENTATIVES IN PRINCIPAL CITIES

SINCE 1915 QUICK-CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 11, OHIO

additional parts or special tools.



Springs by the Millions

Accurate makes springs by the millions—many of our customers use a million a month. That takes a lot of spring know-how, experience and skill. But to produce precision springs in large quantities at nominal cost takes more than that. It takes imagination.

Imagination allows Accurate to approach problems without being too influenced by conventional methods. To successfully produce large quantities of precision springs Accurate customer service begins in the design and engineering stage. Highly developed skill in producing special tooling for large quantities often helps lower overall cost. Springs held to close tolerances are assured by rigid quality control and inspection. Packaging is designed to provide ease of handling and speed the customers' production. Scheduling and planning departments assure quantities delivered to meet your needs and reduce inventory requirements.

That is the type of experience, skill . . . and imagination, that allows Accurate to produce springs by the millions. Plan your springs with Accurate too.

ACCURATE SPRING MANUFACTURING COMPANY

3810 W. Lake St., Chicago 24, Illinois

SPRINGS • WIRE FORMS • STAMPINGS

carburetor has had undisputed sway since the beginnings of the industry. We progressed from single barrel to dual throat models, then to four-barrels, and on some models twin four-barrel carburetors. The novelty this year was the three-, two-barrel carburetor installation which is optional on Oldsmobile and Pontiac. It has some advantages over the four-barrel installation and may enjoy increased popularity.

The most dramatic development, of course, was the emergence of the solid fuel injection system. Although the present systems are out of reach in cost—currently ranging from almost $500 on Chevrolet to around $400 on AMC—this principle holds most promise for the future. It is not unlikely that fuel injection will be common on V-8 engines before any production gas turbine cars are cruising on our highways.

Too, there is the appearance once more of a supercharger installation. Studebaker's Golden Hawk uses the McCulloch supercharger to boost the output of the engine; and a similar unit is found on the Packard models.

The turbocharger, which seems to have the greatest promise of boosting engine output, has not yet found adherents in the passenger car field. Turbochargers have been employed for a number of years on large commercial and industrial engines and appeared this season on the Detroit Diesel, two-stroke Diesel engines used by GMC.

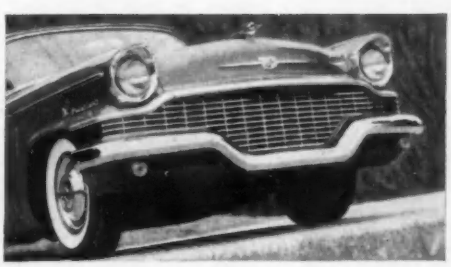
To us the greatest significance of the turbocharger lies in the possibilities of reversing the present trend from large displacement engines to turbocharged engines of relatively small displacement. One of the turbocharger producers claims that his device is capable of boosting output by as much as 100 per cent.

Mercury has something noteworthy in the adoption of the Schwitzer thermostatically controlled fan on models specifying the 255-hp engine. The fan is fitted with a small hydraulic coupling element using silicone fluid. It is arranged to run at a limited top speed under maximum conditions, cutting out automatically when cooling is not required. This device, according to Mercury, saves

Studebaker-Packard announces

Sealed Power KromeX Piston Ring Sets

with new, exclusive Stainless Steel Oil Ring



To augment the selection of the finest parts and accessories for all dealers, Studebaker-Packard in cooperation with Sealed Power engineers now adds a line of KromeX Piston Rings especially designed for replacement service in Studebaker and Packard Engines.

TESTED AND STUDEBAKER PACKARD APPROVED

S-P Superior Performance Guaranteed

PRECISION BUILT PRODUCTS
Parts and Accessories Division
STUDEBAKER-PACKARD CORPORATION

MIDLAND

WELDING NUTS

Cut Assembly Time . . .
Insure Proper Fit of Metal Parts

Modern designers of metal parts are finding Midland Welding Nuts a simple, low-cost means of insuring strong, bolted unions at hard-to-get-at places. Once the nut is welded into position at the exact location, the bolt can be easily turned into it without requiring a holding device on the nut. This not only means a saving in assembly time, but often results in one man being able to do a job previously requiring two.

If you're a manufacturer of metal parts, you can enhance your product appeal and at the same time pass along substantial savings to your customers if you use Midland Welding Nuts. By equipping your product with these lock-sure nuts, assembly flows uninterruptedly and parts fit accurately. Welding nuts are applied in a matter of minutes, last the long life of your product.

Inquire about this economical convenience today. You'll find it pays for itself over and over again.

The MIDLAND STEEL PRODUCTS COMPANY

6660 Mt. Elliott Avenue • Detroit 11, Michigan

Export Department: 38 Pearl St., New York, N. Y.

AUTOMOBILE and TRUCK FRAMES • AIR and VACUUM POWER BRAKES

AIR and ELECTRO-PNEUMATIC DOOR CONTROLS

up to 17 engine horsepower, boosts engine performance, saves fuel, and reduces underhood noise materially. It is something well worth considering.

While on the subject of engines it is pertinent to note that the electrical load is increasing materially due to the increasing emphasis on power devices. The headlighting load has increased; air conditioning constitutes a constant additional load; and small electric motors show promise of installation to handle various types of power mechanisms, including air compressors. If the electrical load continues to grow—and apparently it will—something has to be done about the conventional generator.

There is a feeling abroad that the next step might well be an alternator system similar to that employed in heavy duty vehicles, police cars, ambulances, and military vehicles, but scaled down in size and weight to suit conventional automobiles. Concurrently, considerable work is under way to develop compact silicon rectifiers that would fit into this program.

CHASSIS DETAILS — When it comes to the backbone of the car one can get a lot of arugment as to the type of frame to use; or for that matter whether the frame, as such, should be eliminated. Some have argued for a long time that the integral body and frame is the ideal design form. Regardless of the relative merits of the case, the fact is that a change to the integral body-frame construction entails radical changes in the assembly lines and assembly plants of the industry. It could be done readily only by someone who is considering the building of a new car and a new plant from scratch.

Chassis frames took many shapes for 1957 incident to the lowering of the floor level. In most instances the side rails were straightened and widened in the region of the body shell to provide support at the sills without long outriggers. Cadillac was an exception. Cadillac designed what is essentially a narrow but rigid backbone structure, then carried outriggers for the body mountings. There you have two divergent camps.

We touched earlier on the lower roof lines and lowered floor. Faced with these restrictive limitations,

Ask about Amp's Creative Approach TO BETTER WIRING

for every automotive application

A-MP terminals

Wherever there's a wire in a car there's an A-MP Terminal to connect it.

- Top electrical and mechanical performance.
- Accepted by leading auto and truck manufacturers.
- Patented pressure-crimp eliminates all soldering and welding.
- A-MP Automachines crimp up to 4000 perfect, uniform terminations per hour with unskilled labor.
- A-MP Sales Engineers' electrical terminal knowledge in the auto industry will be valuable in solving your most difficult wiring problems.

AMP INCORPORATED
General Office: 2254 Eisenhower Blvd., Harrisburg, Pa.

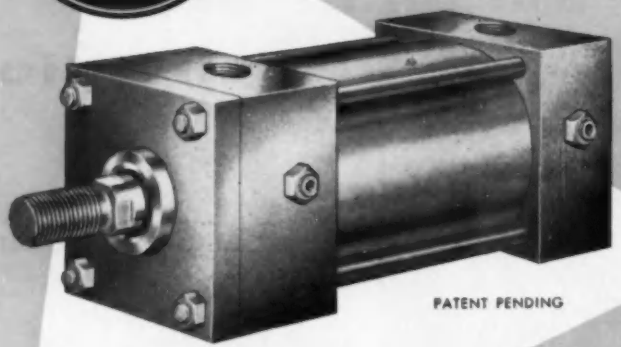
Wholly Owned Subsidiaries: Aircraft-Marine Products of Canada Ltd., Toronto, Canada • Aircraft-Marine Products (G.B.) Ltd., London, England • Societe AMP de France, Le Pre St. Gervais, Seine, France • AMP—Holland N.V. 's-Hertogenbosch, Holland

Japanese Distributors: Oriental Terminal Products Co., Ltd., Tokyo, Japan

A-MP

FOR AUTOMATION

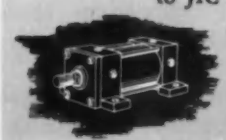
SP CYLINDERS



PATENT PENDING

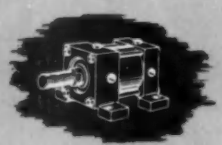
top performance–longest life

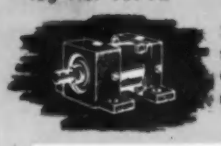
All S-P cylinders are engineered throughout for high speed, efficient operation. Piston rods are heat treated and hard chrome plated to resist scoring. Bronze cartridges with extra long bearing surfaces are easily removable for quick servicing of rod seals and wipers. End plates are rolled steel. All S-P cylinders are built to JIC standards.



S-P STANDARD AIR CYLINDERS have brass tubes to eliminate corrosion. Cushions float on O-rings for maximum cushioning. Eleven bore sizes, 1½" – 14". 21 mounting types. Readily modified for oil or water. Send for Catalog No. 110.

S-P HEAVY DUTY AIR CYLINDERS for automation and other severe applications. Double porting for extreme high speeds. Heavy wall seamless steel tube. Nine bore sizes, 1½" – 8". Five mounting types. Approved and used by two major automobile manufacturers. Send for Catalog No. 109-A.





S-P HIGH PRESSURE HYDRAULIC CYLINDERS have seamless steel tube. Special locking mechanism eliminates tie rods. Designed for 2,000 psi. Eleven models in 11 sizes. Send for Catalog No. 104.

Step up production with S-P cylinders. Representatives in principal cities. Prompt deliveries. Order catalog by number shown above. The S-P Manufacturing Corporation, 30201 Aurora Rd., Solon, Ohio. *In greater Cleveland.*

SPecify SP

SP THE S-P MANUFACTURING CORP.

SOLON, OHIO • *IN GREATER CLEVELAND*

ESTABLISHED 1916 A BASSETT COMPANY

NON-ROTATING AIR AND HYDRAULIC CYLINDERS • ROTATING AIR AND HYDRAULIC CYLINDERS POWER CHUCKS • COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES, ACCESSORIES

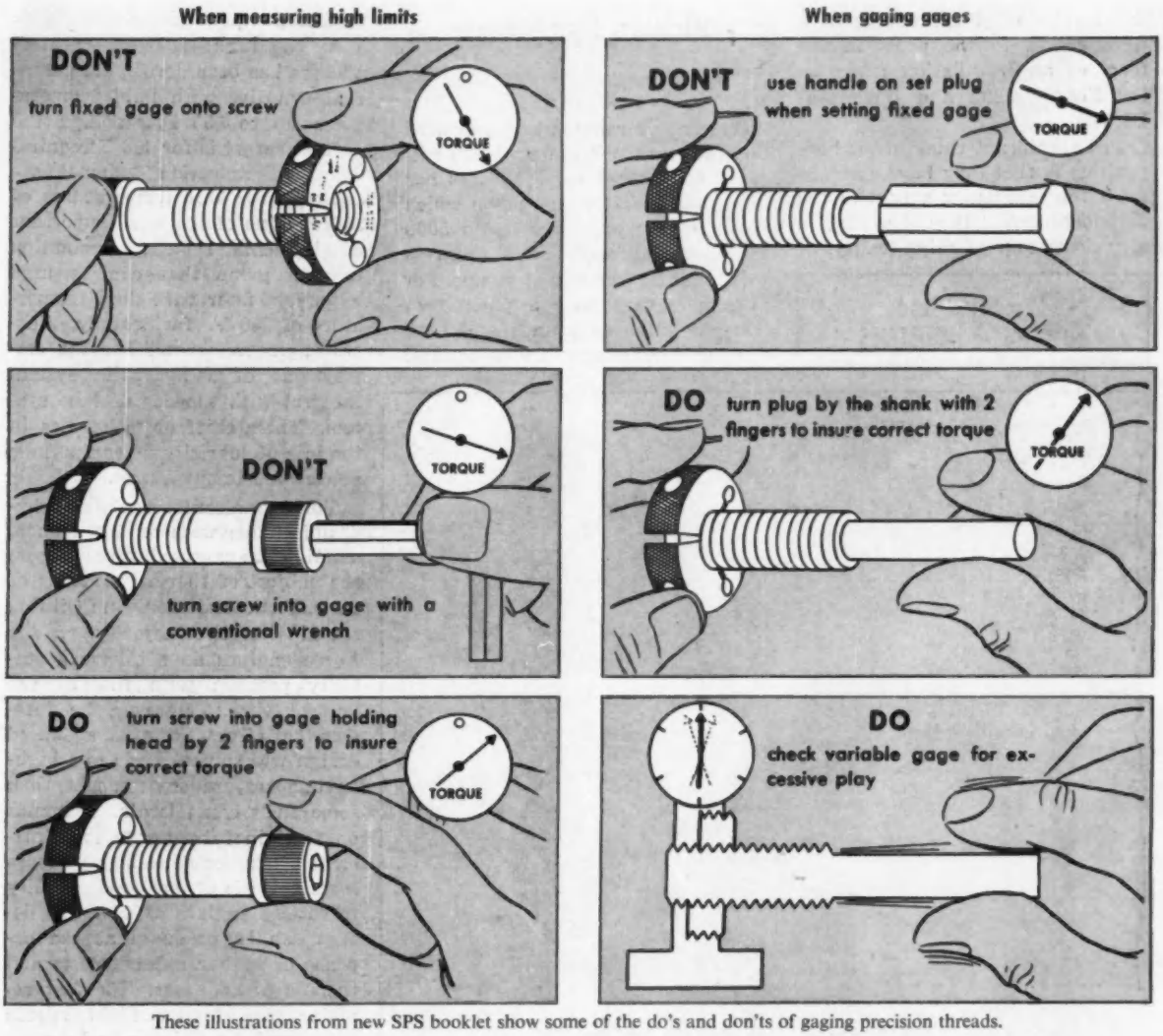
designers had to find some way of locating the drive line without increasing interior tunnel height. GM Divisions solved this problem by adding a third universal joint, using a two-piece propeller shaft. Ford found still another avenue of escape. They stayed with the conventional two-joint propeller drive but introduced a high-offset rear axle. This required considerable development and engineering. Fortuitously, too, Ford needed added manufacturing facilities. Hence it was possible to equip a new axle plant with the special gear generating equipment required for producing the high-offset hypoid gear sets.

Speaking of rear axles, 1957 saw a wider acceptance of the Dana PowrLok limited slip differential. Introduced only a short time ago as optional equipment on Packard cars, this device was next adopted by Studebaker, now is offered on certain truck makes, and was adopted by Chevrolet as optional equipment in 1957. At the SAE meeting in March discussion seemed to indicate widening acceptance of this unique device.

Finally, we should touch on brakes. The squeeze was on in 1957 with the adoption of 14-in. wheels. We don't know exactly how the wheel situation stands, i.e., whether 13-in. wheels will make their appearance in 1958. If they do, the brake problem will really sizzle since even 11-in. brake drums will be difficult to house. Is the disk brake or the Girling brake the answer? We have no definite information at this writing but the situation will bear watching.

GAS TURBINE—No summary would be complete without some reference to the gas turbine. Recent developments seem to indicate that this type of powerplant may appear first on heavy duty vehicles rather than automobiles, at least in the USA. It is significant that only a few months ago Chevrolet announced that the GMR gas turbine, which has been under development at the GM Tech Center, had been installed in a truck tractor and would undergo a period of service testing.

Meanwhile, both GMR and Ford have been doing a lot of work with the free piston engine. Mid-March



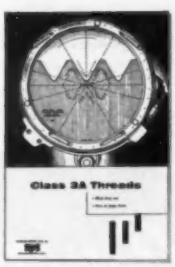
These illustrations from new SPS booklet show some of the do's and don'ts of gaging precision threads.

3A threads: what they are; how to gage them — new SPS booklet tells all

Threads made to Class 3A fit are the most precise in general use in industry. But you do not always get the 3A precision you specify. Because of many different gaging techniques that yield varying results, screws with threads well outside the Class 3A tolerance limits often pass inspection.

SPS has prepared a new booklet on this subject. It explains clearly what Class 3A threads are and the pros and cons involved in the widely varying gaging techniques in use today. It reviews the gaging of high and low limits of 3A threads, sampling techniques, and even the methods of gaging gages.

All standard UNBRAKO socket screw products fall within specified tolerance limits *no matter what method is used to gage them.* Leading industrial distributors carry complete stocks. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 53, Pa.



Form 2239, "Class 3A Threads: what they are; how to gage them." 16 pages, with many illustrations. Write for free copy today.

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION SPS

JENKINTOWN PENNSYLVANIA

the results of Ford development were shown to the press in the form of an installation made by the Ford Tractor and Implement Div.

The significant thing about both projects is that they have emerged from the laboratory stages to the divisional level, thus marking a step closer to production reality.

Executives Read
AUTOMOTIVE INDUSTRIES

Vickers Symposium

(*Continued from page* 69)

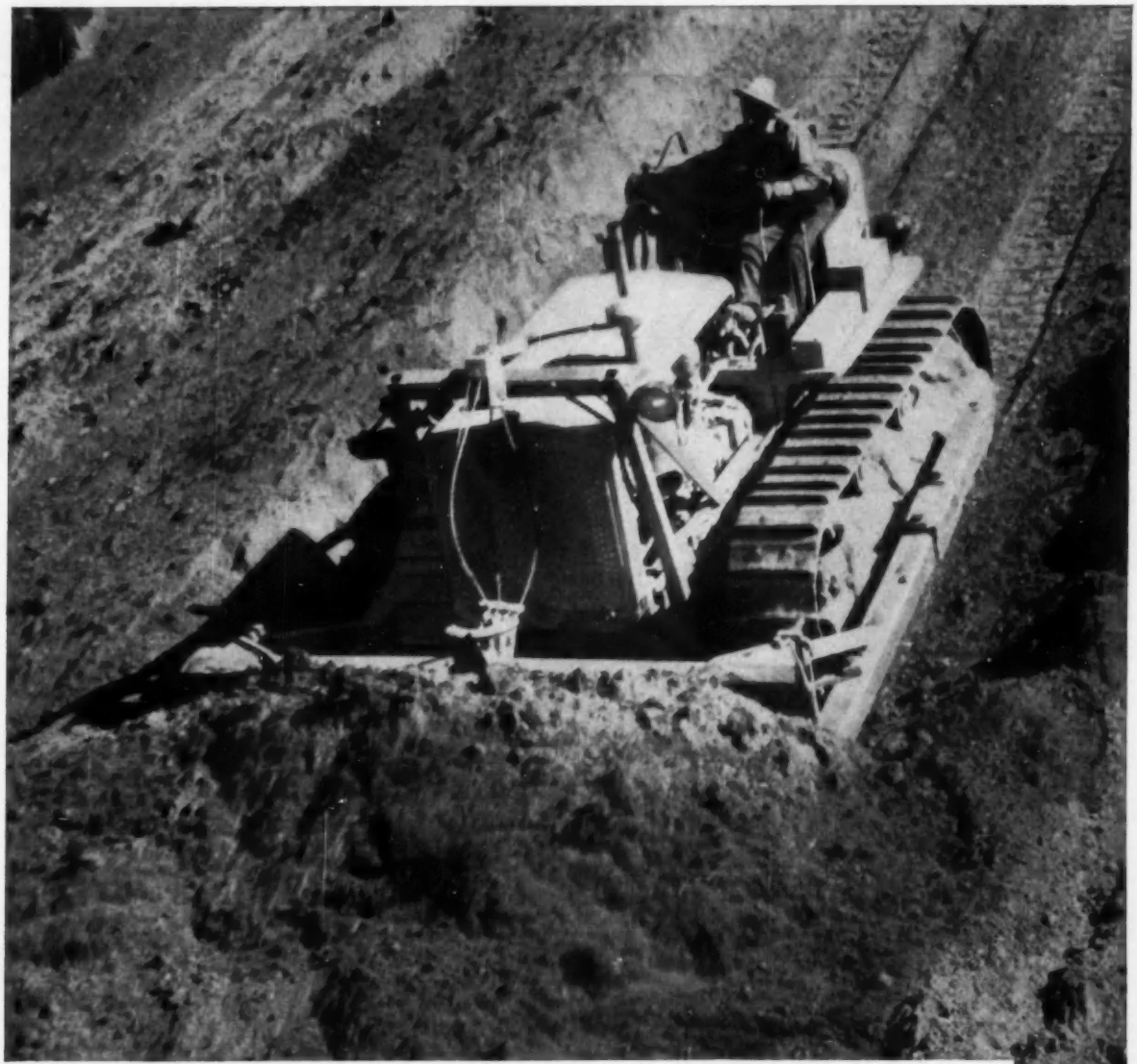
temperature ranges; and improved performance, with pump speed ratings up to 7000 rpm. Vickers has developed an 11-piston pump which can produce pressures up to 5000 psi and has made more progress with miniaturization of pumps. For example, they have a pump that weighs only one pound; and have under development an expendable missile pump weighing only ¾-lb.

In the high temperature area, Vickers has been developing pumps that can live with fluid temperatures up to 550 F, although the current target is for 400 F requirements. Production pumps are available for fluid temperatures of 350 F. One of the most important developments is a contamination tolerant pump that can be used without a filter with fluid temperature of 350 F. Incidentally, Vickers engineers do not like the employment of a hydraulic system integral with the engine lube system. Their chief objection lies in the loss of lubricity of engine lube at elevated temperatures.

Turbine aircraft fuels and hydraulic fluids were on the agenda, as might be expected. Speaking on the subject of thermal stability of fuels, F. E. Anderson, Sun Oil Co., stated that the majority of Air Force engines do not have a stability problem with fuel at the present time. However, he foresees that aircraft of more advanced design will subject fuels to a higher temperature environment than some fuels can tolerate. Demands on fuels in future supersonic aircraft are indicated to be even more severe. Fuels of improved stability to satisfy engines of advanced design can be produced at the expense of higher refining costs and the use of additives. The fact remains that higher flight speeds accompanied by higher fuel system temperatures will make it increasingly difficult to produce satisfactory fuels.

The use of diesters as high temperature hydraulic fluids was discussed by E. E. Klaus and M. R. Fenske, The Pennsylvania State University. The authors emphasized that diester fluids of Spec. MIL-L-7808 and MIL-L-6387 have had some seven years of successful application as hydraulic fluids and lubricants. These materials have substantial improvement over their mineral oil counterparts in terms of volatility. Excellent lubricity of the ester type fluids persist to temperatures of at least 500 F and the esters show good response to lubricity additives. Moreover, the ester fluids have good hermal stability and low corrosion up to about 500 F. The useful life of these

Built to Cool
HARD-WORKING ENGINES
YA® Radiators
Industrial trucks on daily duty take a lot of heavy load punishment . . . and these hard working engines demand a rugged-built, efficient radiator to do the cooling job. That's why more and more manufacturers of motor trucks, tractors, compressors, and locomotives are specifying YA Radiators . . . for they know YA quality and performance! Write to day for complete information on YA radiators designed in cooperation with your engineers to fit your specific needs.
California Representative:
E. E. RICHTER & SON, Emeryville, Calif.
YA® Yates-American
BELOIT, WISCONSIN
BRANCH OFFICES: CHICAGO, ILLINOIS; HIGH POINT, NORTH CAROLINA; MEMPHIS, TENNESSEE; PORTLAND, OREGON



you can meet any lubrication standard if you

BLEND WITH ENJAY PARANOX®

(DETERGENT-INHIBITOR ADDITIVES)

Blended with Paranox, lubricants can be compounded to combine *both* minimum wear and maximum engine cleanliness characteristics. That's why more and more refiners and blenders are relying *exclusively* on Paranox in formulating lubricants for heavy duty equipment and all engines that are subjected to tough operating conditions.

Through years of intensive research and development work with manufacturers and oil companies, Enjay has developed the only *complete line* of high quality additives (Paramins®) that can assure *maximum* performance characteristics. Why not let this experience and know-how work for *you*? Write, wire or phone the Enjay Company today.

ENJAY

Pioneer in Petrochemicals

ENJAY COMPANY, INC., 15 WEST 51st ST., NEW YORK 19, N. Y.

Akron • Boston • Chicago • Los Angeles • New Orleans • Tulsa

Back of a *Chicago Rivet*

Is an Organization That Really Serves

The *RIGHT* rivet, plus the *RIGHT* riveting machine will produce a fastened assembly at the *RIGHT* low cost

The correct combination of rivet and machine requires expert knowledge available to you through Chicago Rivet engineers.

Anticipated production, type of materials to be fastened, assembly shape and its expected service life are factors to be considered. Decisions must be made on a rivet metal or alloy. Type and size of rivet, shape of head and shank, depth of tubular section must be all determined. Are indexing fixtures and multiple setters indicated? Can a standard rather than a special rivet be used? These are the type of questions Chicago Rivet Engineers are daily answering for industry. Their recommendations are available to you without cost. We suggest you send a blueprint or sample assembly with your inquiry.

There are *Chicago Rivet* Machines that will set

1
2
3
4
5
6

Tubular or Split Rivets At a Time

Chicago Rivet & MACHINE CO.

962 South 25th Avenue
Bellwood Ill. (Chicago Suburb)
Branch Factory: Tyrone, Pa.

FOR YOUR FILES
Rivet catalog describing 1388 standard tubular and split rivets and 26 single and multiple automatic rivet setters.

fluids will be dictated primarily by the time of exposure to the highest temperatures.

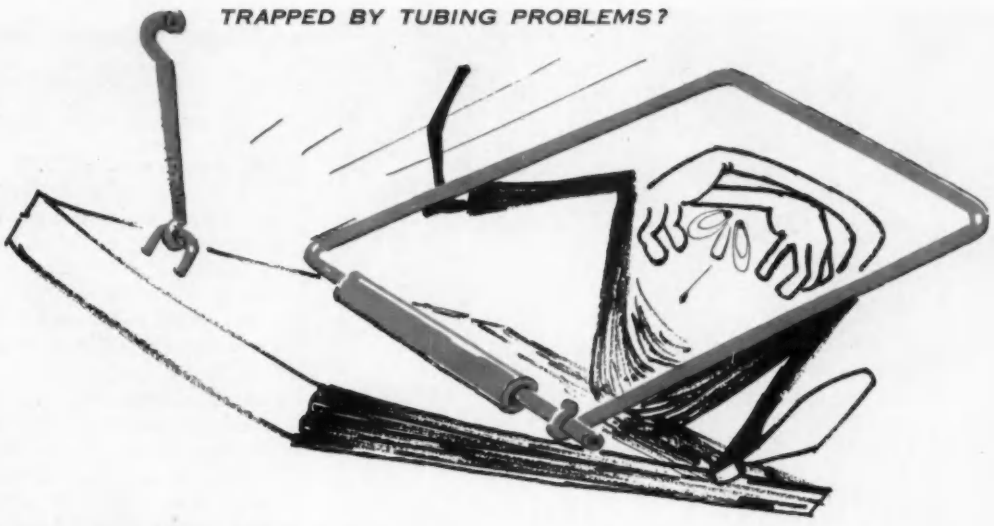
Vickers also presented its hydraulic starting package for jet engines, claiming superiority by comparison with other starting methods. The equipment is driven by a simple aircooled engine, is small in size and light in weight. It is said to have good reliability, low maintenance cost, and a service life around six times that of some other starting systems.

Fuel control was given the full treatment. The session began with a description of the Vickers dynamic fuel control test stand. It is a new and useful tool, said to be capable of giving fuel controls a higher degree of calibration than is possible with current production test stands. Apart from production testing, this device is visualized as an important factor in research for developing and testing fuel systems for new engines. Among the features of this new tool are — flexibility of the computer and a wide range of speeds and power available from the transmission. The new techniques made possible with this equipment call for a reappraisal of present testing techniques, according to Vickers.

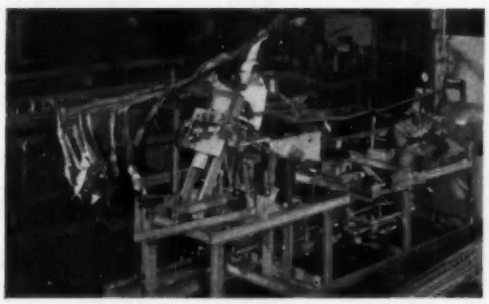
Following the latter presentation, a panel of specialists undertook to discuss the entire area of fuel control testing. The whole subject is so complex that no immediate conclusions could be drawn for the discussion, except for the fact that improved and faster test methods must be explored. L. Lipson, of Navy's BuAer, pointed out that advanced engine designs call for still more control points and will make testing procedures even more complicated in the future. What the military and commercial airlines need is means for reliable testing methods; and diagnostic equipment of new design that will make it possible to handle troubleshooting quickly and effectively.

W. J. Kunz, Jr., of Bendix Products, showed photographs of a new fuel control test unit developed by his company, featuring a 14-channel digital computer, fitted with a tape. It is equipped with a 30-in. wide plotting board to amplify the readings and is said to have an accuracy of 0.1 per cent.

TRAPPED BY TUBING PROBLEMS?



LINES FORMED RIGHT...
WITH GM STEEL TUBING AND UNEQUALED FABRICATION FACILITIES!



Rochester Products' many hydraulic forming fixtures turn out a fast, uniform flow of GM Steel Tubing fuel lines.

Fuel lines . . . oil lines . . . brake lines come *right* from Rochester! The industry's finest equipment forms, fits and fabricates these and other intricate assemblies for America's finest cars.

Rugged, reliable GM Steel Tubing performs its way into more new products every day. Tubing quality, engineering capability and production facility form a cost-cutting, schedule-saving line-up that's ready to go to work for you! Call your Rochester Products Sales Engineer or write us direct.

GM STEEL TUBING BY ROCHESTER PRODUCTS

ROCHESTER
PRODUCTS
DIVISION OF
GENERAL MOTORS
ROCHESTER N.Y.

he **HAD** to use a sanding block!

but **YOU** can use a Buckeye Air Tool!

Why AIR Tools?

Because air is everywhere, just waiting to be put to work . . . because continuous operation can't possibly harm an air tool . . . and because, if you're using Buckeye air tools, you can almost forget about tool maintenance.

There was a time when muscle power—and plenty of it—was needed to finish off a smooth surface. Today, air power, directed through a Buckeye tool, has replaced muscle power. The work gets done faster, naturally . . . and better, of course.

We don't imagine you're still using a wood block and emery cloth, but it's just possible you're not using a modern Buckeye air tool. And that's the only way you can be sure you're doing your finishing work the best and most economical way.

Our Catalog A-10 contains complete information on the entire line of Buckeye abrasive tools, all of it both interesting and helpful to all portable tool users. If you don't have a copy, send us your name, company and address and we'll correct that situation promptly.

In Air Tools, Your Best Buy Is Buckeye

Buckeye Tools
CORPORATION
DIVISION 21 • DAYTON 1, OHIO

Major Changes Coming in '58 Cars

(*Continued from page* 59)

to its use in cars is that its size increases disproportionately in the high horsepower ranges used in present day automobiles.

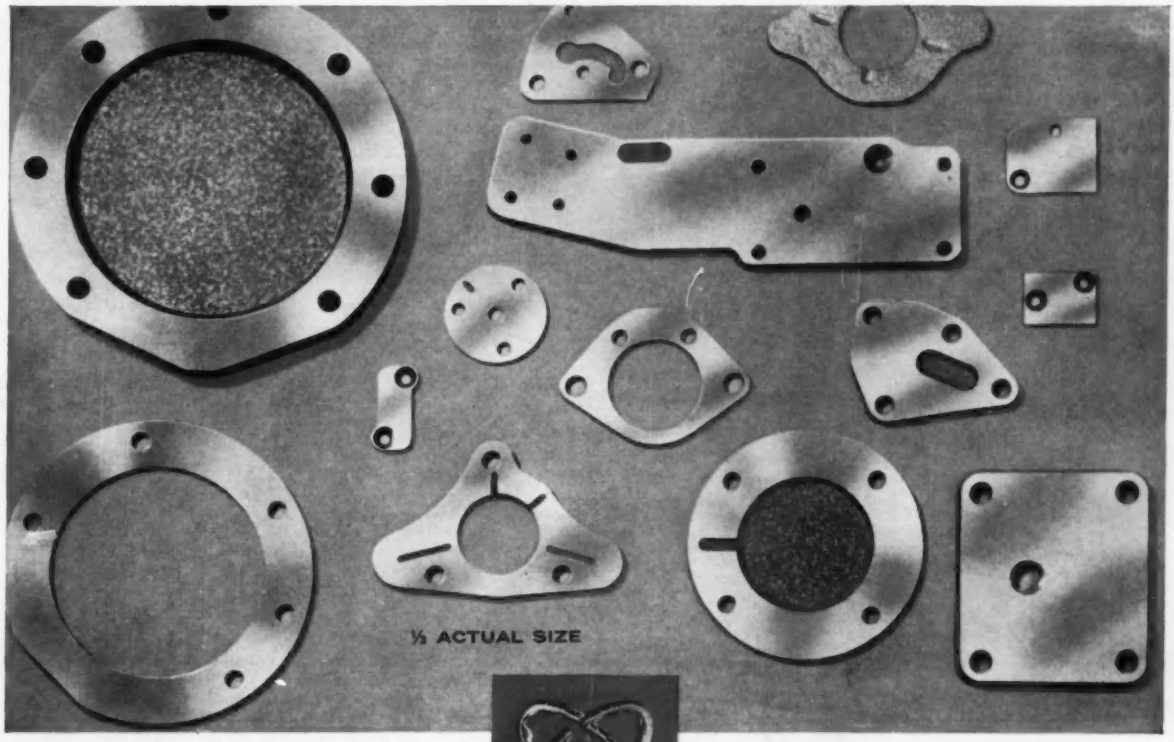
The gas turbine also has some knotty problems yet to be overcome. Fuel consumption is high, operating temperatures require special costly heat-resistant metals, and acceleration lag is too pronounced to be tolerated in comparison with present engine standards.

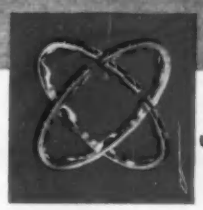
Body design next year will see a continuation of the lower and slimmer roof lines, increased glass area, larger dimensions, and sculptured effects. At least six car makes will have completely new bodies. Those with new styling in 1957 will undergo more than normal off-year changes in order to keep up with the parade. Some of these will have body changes of a very substantial character.

One of the interesting design trends to watch over the next few years is how passenger comfort will be equated with the styling dictates of lower and lower cars. Already there is more than a rumble of public discontent with "low bridge" door openings and middle passenger straddling of the tunnel. With designers now talking of cars only 52 in. high within the next decade, obviously some drastic measures are in order.

It will not be surprising to see sliding roofs, "butterfly" doors, or tilting canopies, such as have been included in "idea" show cars, if the trend toward shoulder-high cars continues. And already there is discussion of moving the transmission rearward to the differential to eliminate or greatly minimize the front floor hump and rear compartment tunnel. A De Dion type mounting would be required to permit the drive shaft to run under the floor without clearance for vertical movement as now is required.

Glass areas are likely not only to increase but to take on more complex configurations. More curved side windows and wrapped over windshields are in prospect, and the side and rear roof areas also will be invaded more and more by



From the producer of piston rings  used in 1 out of every 3 new cars . . .

Precision castings-machined and finished-all at "captive cost"

The world's largest piston ring foundry—Muskegon's Sparta Foundry—is now producing precision castings at surprisingly low cost!

Example: Sparta can give you width tolerances to within .001"; surface finishes and flatness to your specifications. With Sparta precision castings, your finishing and machining operations can be reduced or completely eliminated. The result: lower unit costs, improved design, less machining and assembly time.

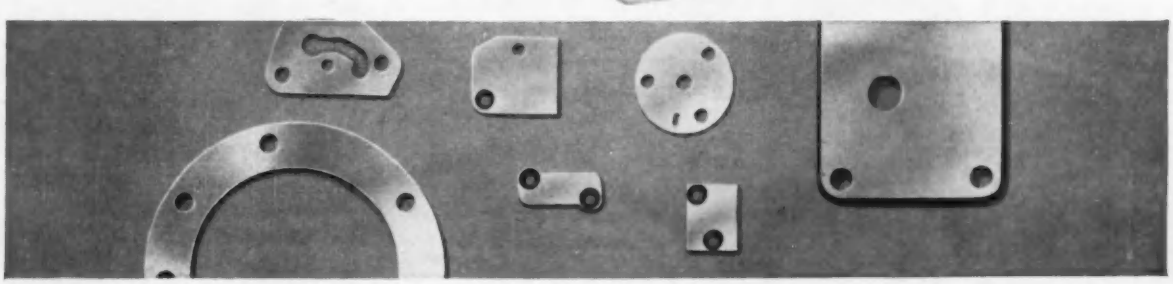
WRITE FOR YOUR FREE SAMPLE KIT

You'll get an assortment of miniature castings in varying degrees of finishing and machining —in a variety of metals, including sintered powdered metals. See how cast-in holes, recesses and projections can eliminate costly machine work. Sparta Foundry Co., Sparta, Mich.

MUSKEGON Piston Ring Co.

PLANTS AT MUSKEGON, MICHIGAN SPARTA, MICHIGAN
ROTARY SEAL DIVISION PLANTS AT SPARTA, MICHIGAN CHICAGO, ILLINOIS

Since 1921... The engine builders' source!



glass. Flush windows to reduce wind noise are a distinct possibility, as is a completely sealed body with fixed windows and heating and ventilating system to control temperature and humidity automatically.

AUTOMOTIVE INDUSTRIES
KEEPS YOU INFORMED

AUTOMATION News Report

(*Continued from page* 68)

and expensive tooling," he explained, "the changeover from one job to the next can be handled almost as simply as replacing one reel of tape with another."

Kanes also pointed out that tape-controlled machine tools could produce dies for the automobile industry in about one-fourth the time required under present methods.

AUTOMATIC TEST EQUIPMENT

Westinghouse Electric Corp.'s Air Arm Division, Baltimore, Md., has made great strides in the development of automatic equipment for the production testing of complex fire control, flight control, and missile systems.

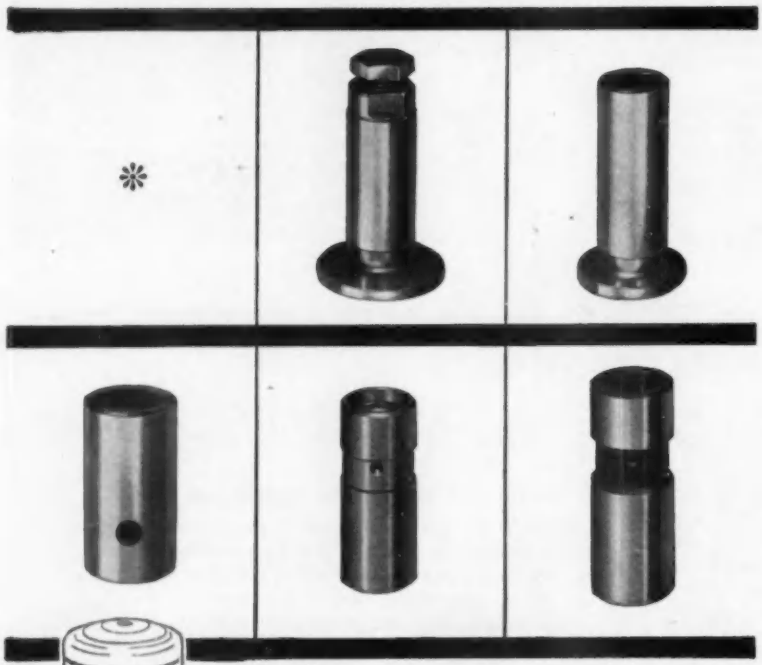
Among the new test equipment devices now installed at the Air Arm Division are the following:

- An automatic molded unit test set checks small molded electronic circuits containing tubes, resistors, capacitors, and transformers. The machine automatically programs as many as 14 tests to each unit at a rate of one per second.
- An automatic turns-ratio tester determines the ratio of turns between primary and secondary transformer windings. Transformers with as many as five windings can be tested in 15 minutes.
- The automatic DCR measures d-c resistance of transformer windings. This device has a wide range (0.001 to 10,000 ohms), is self-calibrating, and is 10 times faster than a manual tester. After starting, no operator is required until all tests are completed.
- A computer test stand provides semiautomatic testing of analog computers. Forty-eight test problems involving 13 input parameters can be solved. Time saving during alignment is 2 to 1, during operation, 8 to 1.
- An automatic function tester measures impedance or voltage of components in electrical circuits and also does functional tests. Tests are automatically programmed at a rate of three per second. Direct-current measurements are accurate to one per cent over the frequency range of 50 cycles to 20 kc.
- An automatic potentiometer checker measures potentiometer resistance, function, hi-pot, and electrical noise. The machine cycles one test per second using punched cards. It has a mechanical accuracy of plus or minus two minutes of arc, and an electrical accuracy of plus or minus 0.015 per cent of full scale.

This new test equipment, accord-

(*Turn to page* 126, *please*)

JOHNSON *tappets*



keep pace with today's engines

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

"tappets are our business"

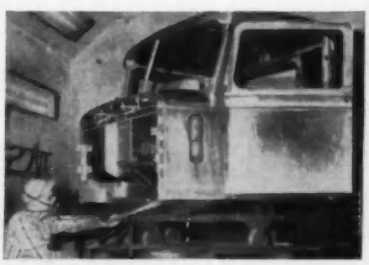
JOHNSON JP PRODUCTS inc.
MUSKEGON, MICHIGAN

AUTOCAR TRUCKS take the work as it comes. No load is too heavy, no haul is too tough. And the Duridized phosphate coating permanently bonds the finish to the metal.

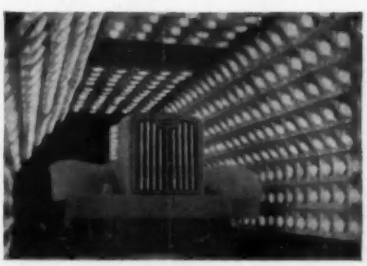
ACP Duridine®

PREPAINT CHEMICAL TREATMENT SIMULTANEOUSLY CLEANS AND PHOSPHATE COATS SHEET STEEL USED IN FAMED AUTOCAR TRUCKS

ALL SHEET METAL receives the ACP Duridine treatment. This removes all traces of grime and oil and produces on the metal a thin hard coating of nonmetallic phosphate which forms an excellent bond for the paint finish.



HIGH QUALITY FINISHES on Autocar trucks are assured by the ACP Duridine treatment, plus equipment and materials incorporating the latest technical developments. Skilled personnel add their experience.



HARD, DURABLE FINISHES, bonded with ACP Duridine, protect the metal in Autocar trucks. Uniformly controlled infrared baking of paint is done while the truck moves along the chassis line.

As simple as alkali cleaning, but much more effective, ACP Duridine cleans and phosphate coats steel in a single operation. It carries off harmful surface dirt, oil and grease. It develops a thin, tight, close-grained nonmetallic phosphate coating which inhibits corrosion and forms an excellent bond for the paint finish. It is applied in 1 to 3 minutes in a 4-stage power spray washer.

Learn more about ACP Duridine

Write for Bulletin 1406 today

CHEMICALS ACP PROCESSES

AMERICAN CHEMICAL PAINT COMPANY, Ambler 24, Pa.

DETROIT, MICH. • ST. JOSEPH, MO. • NILES, CALIF. • WINDSOR, ONT.

New Chemical Horizons for Industry and Agriculture

Where else can
DUREZ PHENOLICS
do the job best?

This oil pump gear is another example of how a value analysis can indicate change-over to a Durez engineering plastic.

Chrysler Corporation engineers saved about two-thirds the cost of the former metal gear when they pioneered with Durez in developing this precision-molded plastic part.

Performance in withstanding the heat and friction created in automotive transmissions showed remarkable improvement. Molded of a glass-fiber-reinforced compound, Durez 16771, the plastic pump gear showed no performance-affecting wear after 200,000 miles. The same degree of wear was visible in the former part of metal at 70,000 miles. Noise reduction is another major achievement.

What makes Durez thermosetting phenolics so inviting to engineers in search of new and better materials, lower unit cost, faster assembly, and longer service? *Their properties are available in well-balanced combinations.* Electrically non-conductive, chemically inert, Durez withstands heat and impact, is unaffected by moisture, molds readily to any shape, and needs little or no finishing.

For help in evaluating Durez for whatever component you may have in mind, consult your molder. Or feel free to call on our field service for technical counsel.

PHENOLICS PROPERTIES WORTH INVESTIGATING

- Dimensional stability
- Non-conductivity
- Resistance to heat and cold
- Impact strength
- Resistance to moisture
- Chemical resistance
- Moldability in intricate shapes
- Moderate cost

DUREZ® Phenolic Plastics that Fit the Job

DUREZ PLASTICS DIVISION
HOOKER ELECTROCHEMICAL COMPANY
2005 Walck Road, North Tonawanda, N. Y.

HOOKER CHEMICALS PLASTICS

ing to R. K. McDevitt, manufacturing manager of the Air Arm Division, has been responsible for a substantial increase in production, reduced manufacturing costs, and an improvement in product quality.

Test hours, which once took up 30 per cent of total production time, have now been reduced from 75 to 95 per cent. In addition, automatic testing devices have been able to uncover defects that did not show up in a manual check.

Lead and Zinc Processors

(*Continued from page* 64)

to a solder of 70 per cent zinc and 30 per cent tin used with aluminum.

Development of the gas turbine engine poses a new threat to certain uses of zinc. While the engine is not now seen as likely for passenger cars, it may well be used in trucks within 5 to 10 years. The gas turbine engine requires no radiator and contains no zinc in its construction. A more likely candidate for passenger car installation, however, is the free piston engine, which does require a radiator, said Mr. Gurski.

Use of zinc die castings in Europe may double within the next four or five years, according to R. Lewis Stubbs, director of the Zinc Development Association in England, largely because the automobile production is expected to rise. It has been predicted that there will be nine million more cars on the road in Europe by 1960. Estimates are that the present three million cars produced per year will rise to about five million by 1960. British cars have about as many zinc die castings per car as those in the United States, he said, while German and French cars have considerably less. European manufacturers are now working at chrome plating these pieces.

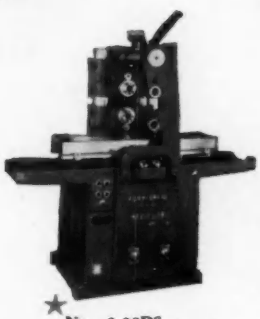
Zinc is used extensively as zinc oxide in tires and other rubber items, R. P. Dinsmore, vice-president research and development, Goodyear Tire & Rubber Co., told the group. There are many synthetic rubbers, most of which use the oxide also. The rubber indus-

(*Turn to page* 130, *please*)

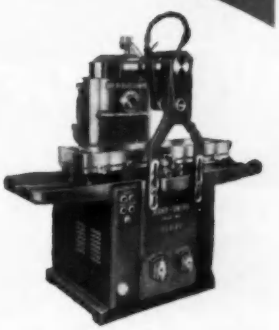
Every one a Star

for speedy accurate milling!

★ No. 3-36 . . . 36" table travel . . . 64" x 16" table . . . full automatic hydraulic feed.



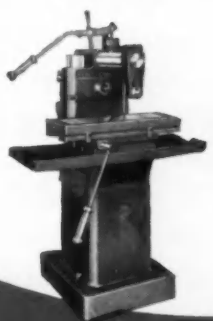
★ No. 2-20DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42" x 12" table. Hydraulic feed.



★ No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

You'll turn out milling jobs with stepped up speed and accuracy with the work on Kent-Owens Machines! These extra-rugged Millers are performance-proved . . . simple . . . versatile . . . practical in every detail. Advanced features throughout! Twin-post head mounting assures balanced load. Only two gear contacts, motor to spindle, means greater cutting efficiency. Check your needs! Write today for bulletins on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, Ohio.

★ No. 1-14 . . . 14" table travel . . . 32" x 9" table . . . hydraulic table feed . . . full automatic cycle.



★ No. 1-M . . . Hand feed to table and head . . . 25" x 9" table travel . . . head counter-balance is adjustable.

CALL ON

KENT-OWENS

for milling machines

KENT-OWENS REPRESENTATIVES

BOSTON
General Machinery Corp.

BUFFALO
Beeler-Robinson Machy Co.

CHICAGO
Fine Steels Machy Company

CLEVELAND
Gross Machinery, Inc.

DALLAS
Mann Machine Tool Co.

DAYTON
C. B. Gossett Machy Co.

DETROIT
A. C. Hamilton Machy Co.

FT. WAYNE
Gross Machinery Co.

GRAND RAPIDS
Joseph Monahan

HAMILTON, ONT.
E. P. Barber Machy Company

HARTFORD
Herrington Machinery, Inc.

HOUSTON
Oliver H. Van Horn Co., Inc.

INDIANAPOLIS
Gross Machinery Co.

KANSAS CITY
Eichman Machinery Co.

LOS ANGELES
Machinery Sales Co.

MILWAUKEE
Fine Steels Machy Company

MINNEAPOLIS
The Saunders Company

MOLINE
John T. Normoyle Co.

MONTREAL
E. P. Barber Machy Co.

NEW ORLEANS
Oliver H. Van Horn Co., Inc.

NEW YORK
Herrington Wilson-Bryan Corporation

PHILADELPHIA
Colen Machinery Company

PITTSBURGH
Barnes Machinery Company

ROCHESTER
E. W. Schaefer Machinery Co.

SAN FRANCISCO
Bohan Machinery Co.

ST. LOUIS
Wm. Kohen Company

SYRACUSE
J. F. Gross Machy Company

TORONTO, ONT.
E. P. Barber Machy Company

WINDSOR, ONT.
E. P. Barber Machy Company

Find out whether this new machine will bore your parts 3 to 8 times faster!

Parts with long holes . . . or identical parts,

The new LeBlond-Carlstedt Rapid Borers solid bore, trepan or counterbore holes 3 to 8 times faster than by the conventional D-bit method! *Hole capacity from 5/16" to 4-1/4" diameter.* Basically, the Rapid Borer is suited to work that is symmetrical for balance in rotation—round, square, octagonal, tapered or stepped. A wide variety of hole diameters and depths as well as work sizes can be handled.

The Rapid Borer was developed expressly to accommodate revolutionary new tooling which cuts at very high speed with good accuracy and finish. Cutting oil at high pressure is forced between the boring bar and hole wall forming a continuous bearing. It flushes back through a hole in the boring head and bar, carrying away the chips as it goes. Chip form is controlled both by tool angles and proper feed and speed combinations; thus tool faces are kept clean and chip passage clear. Cutter design produces balanced cutting pressures thereby controlling concentricity.

This new tooling requires a machine with the following characteristics, all of which are incorporated in the LeBlond Rapid Borer design—High spindle horsepower; Ample rigidity throughout; Complete absence of vibration at all speeds; Infinitely-variable feeds, independent of speeds, while running under load; Final drive to spindle through belts; Large volume of cutting oil. Available in 3 sizes, No. 15, No. 30 and No. 60.

Tell us about the holes you'd like to produce faster. Large holes or small. If the Rapid Borer can handle the job, we'll show you how to produce them faster than ever before. Other equipment available for holes larger than 4¼".

THE R. K. LEBLOND MACHINE TOOL COMPANY
Dept. N. Cincinnati 8, Ohio

Gentlemen:
We want to know if your Rapid Borer really will bore our part 3 to 8 times faster. Here's a description of the job.

*Size of hole to be bored*_____

*Length of hole to be bored*_____

*Annual production of parts*_____

*Material and Hardness*_____

Conformation of part and dimensions (send sketch or print)

Name_____

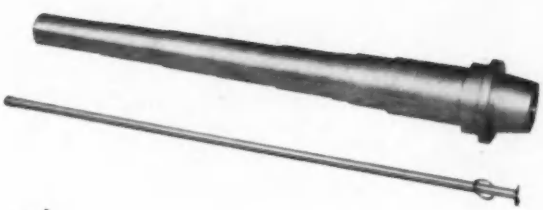
Title_____

Company_____

Address_____

City_____ State_____

bored as one piece, then cut apart.



These tremendous production savings can be yours!

Rapid Borer Time: 5.2 minutes
D-Bit Time (old method): 41.5 minutes
Hole diameter . . . 1-17/32"
Hole length . . . 31¼"
Part material . . . C-1141 Hot Rolled 187 Brinell
Part outside diameter . . . 2.450" at small end, 2.710" at large end.
Feed rate (solid bore) . . . 6" per minute

Rapid Borer Time: 17.75 minutes
D-Bit Time (old method): 86 minutes
Hole diameter . . . 2-3/16" Core diameter . . . .852"
Hole length . . . 53¾"
Part material . . . 4140 Forging 200 Brinell
Part outside diameter . . . 3.455" at small end, 4.425" at large end.
Feed rate (trepanning) . . . 3" per minute

For complete information write for Bulletin LC 201 N

THE R.K.LeBLOND MACHINE TOOL COMPANY

Cincinnati 8, Ohio

World's Largest Builder of a Complete Line of Lathes for more than 70 years

LeBLOND of Cincinnati

Lead and Zinc Processors

(*Continued from page* 126)

try expects an increase of 80 to 83 per cent in rubber usage during the next 20 to 25 years, he said, and this will probably mean a like increase in its use of zinc oxide.

At the annual meeting of the board of directors, S. D. Strauss was elected president of the American Zinc Institute. Mr. Strauss is vice-president and manager of sales, American Smelting and Refining Co., New York City.

Other officers elected were three vice-presidents, J. D. Bradley, The Bunker Hill Co., San Francisco; Clarence Glass, Anaconda Sales Co., New York City, and H. L. Young, American Zinc Sales Co., St. Louis. E. V. Daveler, American Zinc, Lead and Smelting Co., New York City, continues as treasurer and J. L. Kimberley was reelected executive vice-president and secretary.

Directors elected for the term expiring 1960 were John D. Bradley, The Bunker Hill Co., San Francisco; R. B. Caples, Anaconda Co., New York City; E. V. Daveler, American Zinc, Lead and Smelting Co., New York City; Clarence Glass, Anaconda Sales Co., New York City; R. L. McCann, The New Jersey Zinc Co., New York City; G. W. Potter, Potter-Sims Mines, Inc., Joplin, Mo.; F. A. Wardlaw, Jr., International Smelting and Refining Co., Salt Lake City, Utah; H. I. Young, American Zinc Lead and Smelting Co., St. Louis, Mo.; and Miles M. Zoller, The Eagle-Picher Co., Cincinnati, Ohio.

William J. Welch, vice-president and manager metal department, National Lead Co., New York City, was elected a director to fill a vacancy on the board for the term expiring 1959.

"PONY POWER" MOTORS

that give stamina to your products

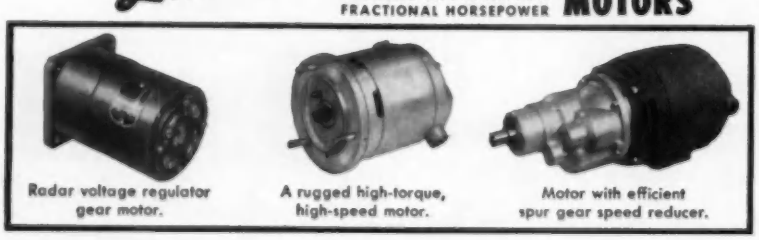
Lamb Electric ***fractional*** horsepower motors, like the small horses of the famed western-pioneer-day Pony Express, are developed for *stamina.*

Their dependability, and efficiency (optimum weight-size-horsepower ratio) are qualities that result from proper design and careful manufacture by personnel with many years of experience in the small motor field.

May we demonstrate how Lamb Electric Motors can bring these advantages—and also perhaps lower costs—to *your* products?

THE LAMB ELECTRIC COMPANY • KENT, OHIO
A Division of American Machine and Metals, Inc.
In Canada: Lamb Electric — Division of Sangamo Company Ltd. — Leaside, Ontario

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS



Radar voltage regulator gear motor. A rugged high-torque, high-speed motor. Motor with efficient spur gear speed reducer.

BUSINESS PULSE

(*Continued from page* 98)

that the particular weaknesses which prevailed through the first quarter of the year—the decline in residential construction and the cessation of inventory accumulation—will moderate, but it can be contended with some plausibility that compensating weakness will develop in fixed business investment. This means that a net gain is uncertain. Moreover, there is a possibility that recent strength in the net foreign investment component of GNP will lessen, now that the Suez canal has been reopened and European supply sources—particularly for oil—tend back to normality.

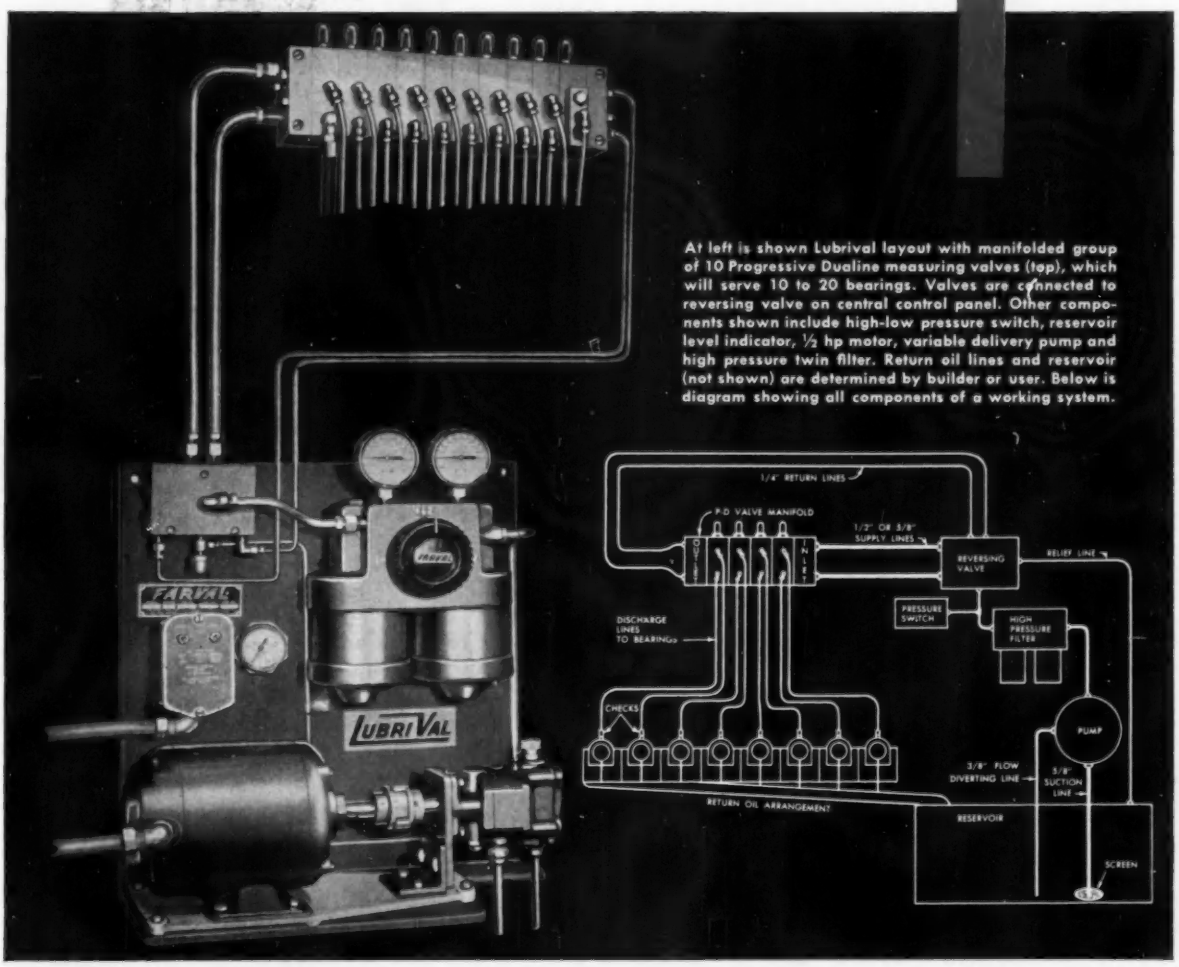
Stability Will Continue

All things considered, a strong case for departure from present stability between now and, say, the end of the third quarter of the year is difficult to make. The most reasonable assumption seems to be that approximate stability will persist. The dollar value of gross national product may continue to rise as long as the volume of consumer spending holds up, but this would hardly be indicative of much real expansion. The final quarter of the

(*Turn to page* 134, *please*)

LUBRIVAL—a revolutionary new system to supply and circulate lubricating oil

FARVAL—
Studies in Centralized Lubrication
No. 204



At left is shown Lubrival layout with manifolded group of 10 Progressive Dualine measuring valves (top), which will serve 10 to 20 bearings. Valves are connected to reversing valve on central control panel. Other components shown include high-low pressure switch, reservoir level indicator, ½ hp motor, variable delivery pump and high pressure twin filter. Return oil lines and reservoir (not shown) are determined by builder or user. Below is diagram showing all components of a working system.

● Lubrival is designed for low volume, high pressure circulating lubrication of presses, automatic and semi-automatic machine tools and other industrial equipment designed for circulating oil systems.

Lubrival is a Farval system, employing the Dualine principle of delivering oil to measuring valves which pass it under pressure to bearings. Lubricant is force-fed by positive piston displacement. Flow can be regulated over a range of 10 ounces to 1 gallon per minute.

Lubrival Progressive Dualine Valves, manifolded in any number required, have individual sight indicators. A pressure sensing mechanism warns of clogged or broken lines in *any part* of the system—a feature entirely new to circulating oil systems.

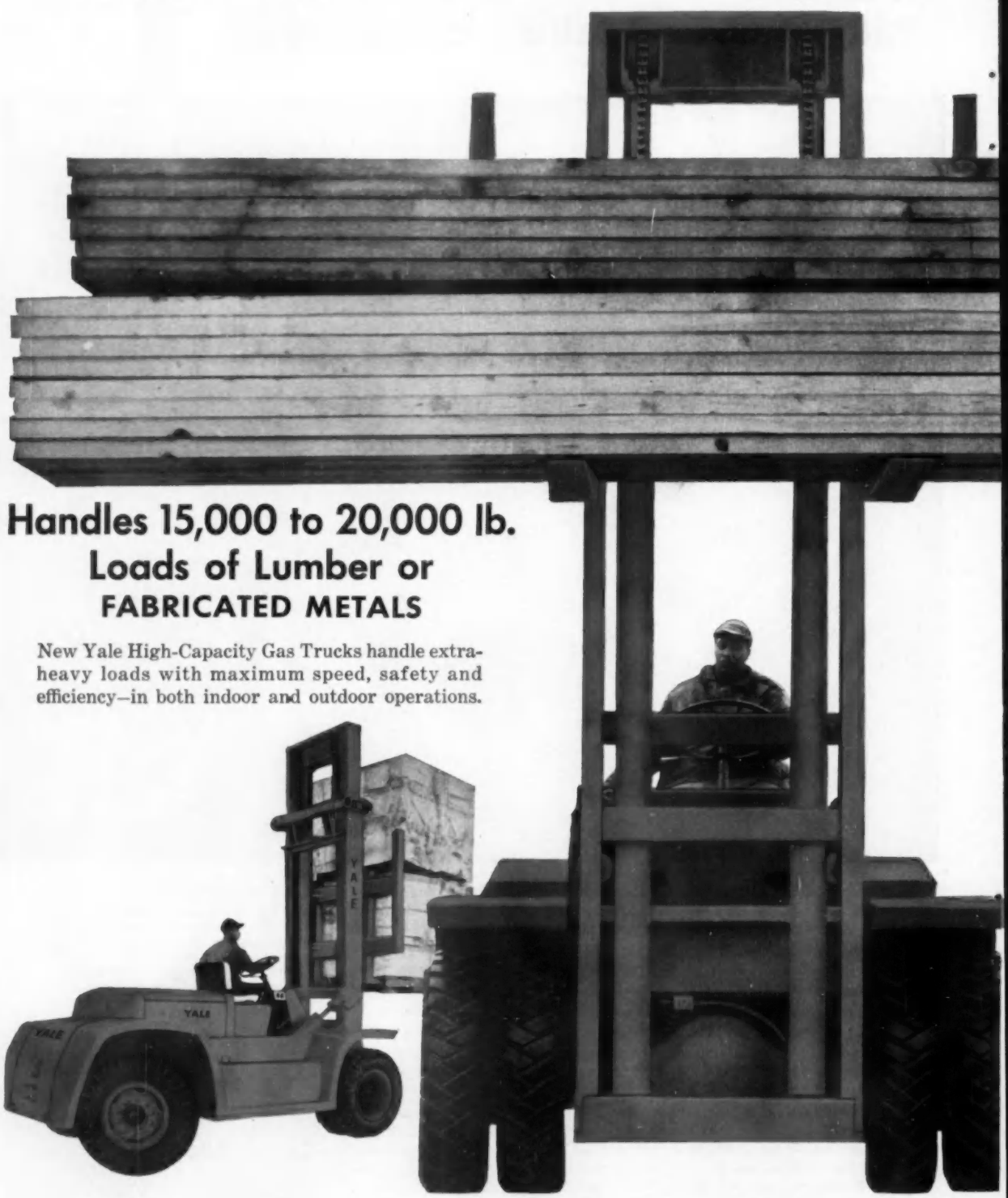
For dependable protection of bearings and economical operation of machines, look into Lubrival. If you are a builder, offer Lubrival protection to your customers. If you use presses and machine tools, specify Lubrival on your next equipment order. The Farval representative near you will give you all details. Or write for Bulletin 70. The Farval Corporation, 3296 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.

KEYS TO ADEQUATE LUBRICATION—
Wherever you see the familiar Dualine valve manifolds, dual lubricant lines and central pumping station, you know a machine is being properly lubricated. Farval manually operated and automatic systems protect millions of industrial bearings.

To meet the need of expanding industries for better materials handling methods, look to Yale for advances in research, engineering, manufacturing, sales and service—as YALE BUILDS FOR THE NEW ERA

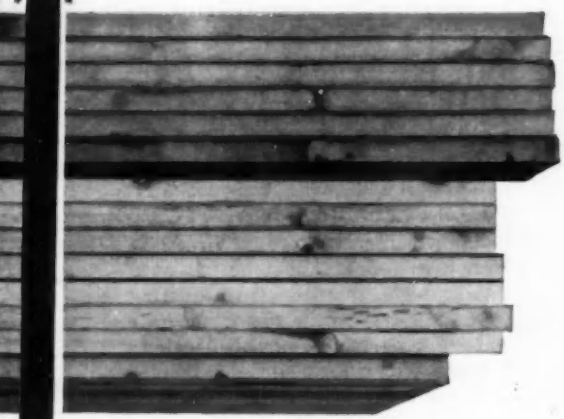
Now...first and



Handles 15,000 to 20,000 lb. Loads of Lumber or FABRICATED METALS

New Yale High-Capacity Gas Trucks handle extra-heavy loads with maximum speed, safety and efficiency—in both indoor and outdoor operations.

only high-capacity gas truck with full visibility



YALE
WIDE-ANGLE VISION

300% MORE VISIBILITY THAN ANY OTHER TRUCK OF ITS TYPE! Not just straight-ahead vision—but "corner of the eyes" vision, too—*fully functional* visibility with the big, open look of new Yale High-Capacity Gas Trucks. Operator sits high and in center. Upright channels are wide-spaced, nested to reduce frontal obstruction. Right next to them—the hoisting cylinders, one right, one left. Chains that raise carriage are in front of cylinders—*out* of the arc of vision.

Carriage has one top bar, one bottom bar—good visibility between them at all levels of fork lift. Channel cross members are at channel ends—none between. When an attachment is used, hydraulic hoses are located in front and behind cylinders—not in the line of sight. Whether looking forward or to the rear, the operator sees more. Result: these new Yale trucks with "Wide-Angle Vision" promote safer, faster, more efficient handling of 15,000 to 20,000 lb. loads.

GREATER STABILITY. Lifting, lowering, traveling—these Yale trucks keep capacity loads in precision balance! Minimum weaving with full loads, because the trucks are built low—low center of gravity, with high underclearance. Extremely rugged design. Broad lifting base afforded by two ball-mounted lift cylinders. Wide channel-roller spacing at all points of lift, plus side-thrust rollers on channels and carriage, further increase stability factor. Large-size, high-flotation tires give good traction under severest terrain conditions.

FAST CYCLE OPERATION. New Yale High-Capacity Gas Trucks have lifting speeds up to 60 feet per minute; fast, safe lowering; travel speeds up to 20 miles per hour; easy maneuverability.

TOP PERFORMANCE UNDER TOUGHEST CONDITIONS

Here are just a few of the premium engineering features—all included as *standard*—that give new Yale Gas Trucks a big edge in stamina and safety under all conditions:

- I-beam side members in frame for extra strength.
- Channels mounted on ball-bearing rollers to reduce friction and wear.
- Ball-mounted, self-aligning hoisting cylinders.
- Gear shift lever, plus hoist, tilt and attachment lever at right side of driver. Directional control lever conveniently located on steering column.
- Power steer with two balanced hydraulic cylinders, one to each rear wheel, to reduce stress on bearing points and linkage.
- Your choice of Yale Fluid Coupling or standard transmission.

Designed for complete selection of attachments—engineered for a minimum loss distance.

YALE*

*REG. U. S. PAT. OFF.

INDUSTRIAL LIFT TRUCKS AND HOISTS

YALE & TOWNE

The Yale & Towne Mfg. Co., Materials Handling Div. Manufacturing Plants in Philadelphia, Pa., and San Leandro, California

The YALE & TOWNE Manufacturing Co., Dept. A-75
Roosevelt Blvd., Philadelphia 15, Pa.

Please send the new Yale High-Capacity Gas Truck brochure No. 5230.

Name_____ Title_____

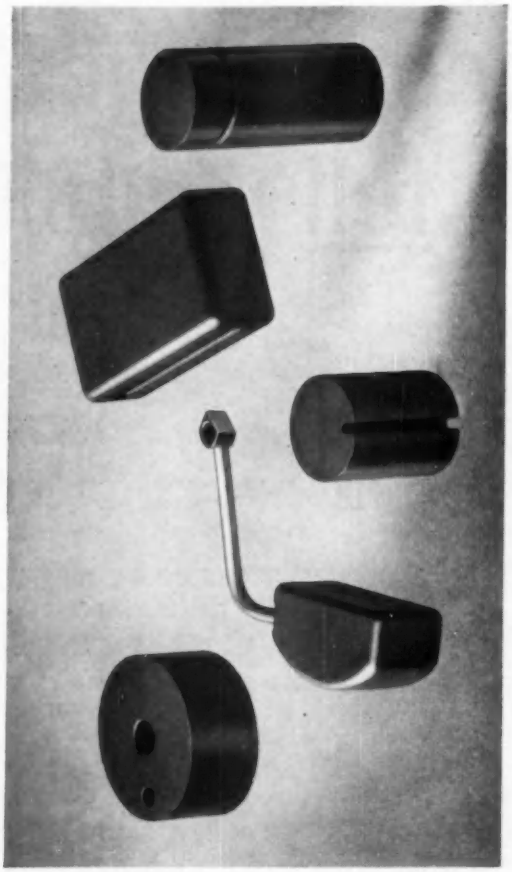
Company_____

Address_____

City_____ Zone____ State_____

In Canada: write The Yale & Towne Manufacturing Co., St. Catharines, Ontario, Canada

Gasoline, Electric & LP-Gas Industrial Lift Trucks • *Worksavers* • Warehousers • Hand Trucks • Hand and Electric Hoists



These floats come in one piece and stay that way

Floats made by Rogers are molded in one piece of cellular rubber, an exceptionally buoyant material composed of myriads of sealed, gas-filled cells. The floats are puncture-proof, homogeneous and uniform. Ridges, slots, grooves and other three-dimensional requirements are integrally molded. Levers can be attached during molding.

Just as important, the rubber used for your floats is specifically formulated to withstand attack by the chemicals it will contact. Fluid absorption is so low as to be insignificant—the sealed, gas-filled cells present a virtually impenetrable barrier to liquids. You get a float that stays afloat indefinitely.

You can—as others are already doing—improve fluid control with Rogers floats. We welcome special requirements. Write Dept. A, Rogers Corporation, Rogers, Conn., for further details.

ROGERS
CORPORATION
ROGERS CONNECTICUT

DUROIDS • SHOE MATERIALS • ELECTRICAL INSULATION • PLASTICS • RUBBER • FABRICATING • DEVELOPMENT

BUSINESS PULSE

(*Continued from page* 130)

year might well witness some revival of general business, owing to the stimulus of new-model production in the automobile industry, but that period is too far ahead to anticipate other trends with any certainty.

Incidentally, the cessation of inventory accumulation in the first quarter of the year (this is indicated by estimates of the Council of Economic Advisers) should not, strictly speaking, be described as a "weakness," even though it did operate to reduce the gain in GNP between the last quarter of 1956 and the first quarter of 1957. Actually, it indicates that businessmen have made progress in adjusting their stocks to the more moderate business tempo, and this is all to the good. Had business continued to build inventories at the fourth-quarter annual rate of $4.1 billion, the possibility of recession in the latter part of this year would almost certainly have been enhanced. Instead, the prevailing caution is a factor strengthening the outlook for the second half, since presumably inventories are in a more balanced situation than would otherwise have been the case.

There has been no concrete evidence to date of any shift in Federal Reserve monetary policy. Officials apparently continue to pursue a "passive" or "neutral" policy, waiting to see how the economic winds will eventually blow.

Republic Aviation Corp. has announced that its Guided Missiles Div. will produce components of an intercontinental ballistic missile for General Electric Co.

* * *

Cornell Aeronautical Laboratory, under sponsorship of Goodyear Tire & Rubber Co., is studying the problem of automobile tire thumping.

* * *

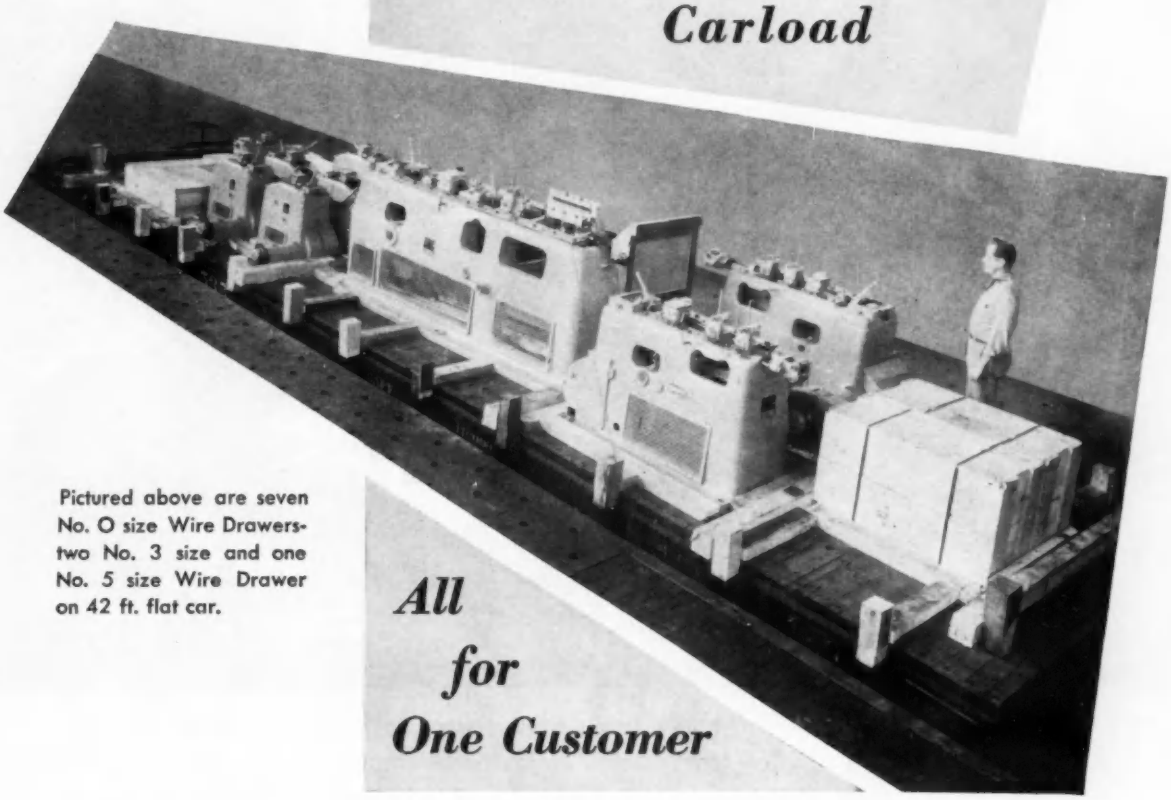
Norton Co. has established new district offices in Atlanta, Ga., and Indianapolis, Ind. . . . Huck Manufacturing Co. has opened a new branch in Englewood, Calif.

* * *

Massey - Harris - Ferguson, Ltd., has set up a new subsidiary in Brazil.

Ajax-Hogue

Wire Drawers by the Carload



Pictured above are seven No. O size Wire Drawers-two No. 3 size and one No. 5 size Wire Drawer on 42 ft. flat car.

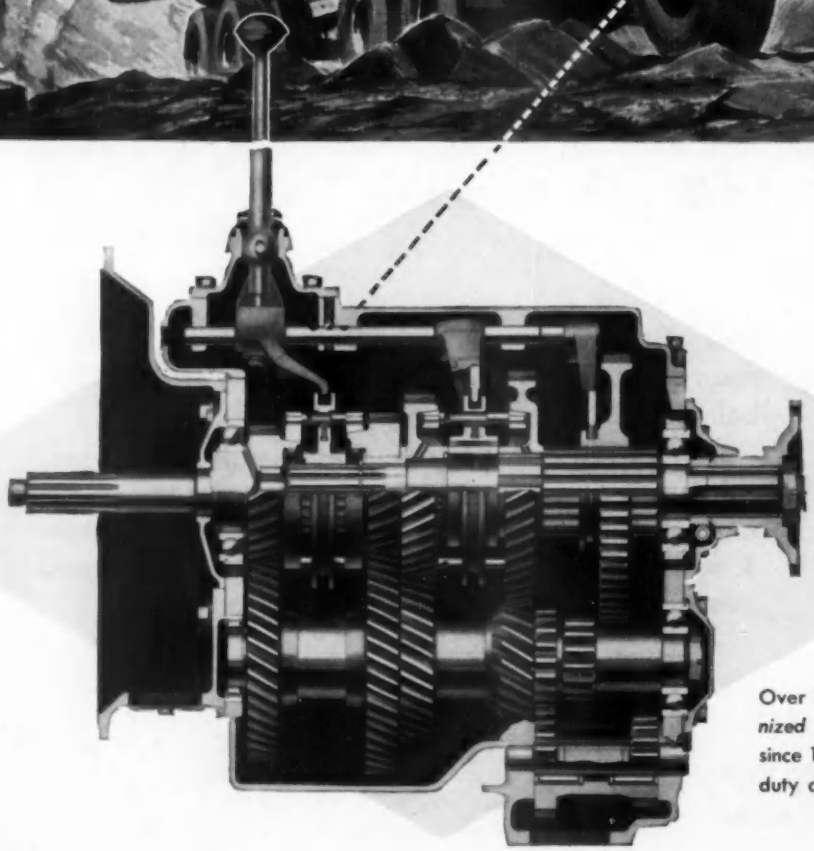
All for One Customer

One of the larger cold heading plants will attach these **Ajax Hogue Wire Drawers** to ¼", ½" and ¾" bolt makers.

If you have cold headers or bolt makers you, too, can attach **Ajax Hogue Wire Drawers** to your machines and take advantage of **lower material costs - straight & accurate wire blanks - easier heading - Increased header die life and improved products.**

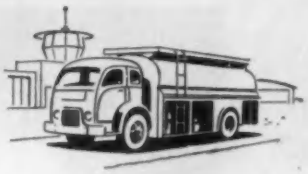
Write for Bulletin 111-A

THE **Ajax** MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND 17, OHIO
110 S. DEARBORN ST., CHICAGO 3, ILLINOIS
W. P. WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.



Over 275,000 Spicer *Fully Synchronized* Transmissions have been built since 1934 for every kind of heavy-duty civilian and military use!

DANA CORPORATION • Toledo 1, Ohio



–it's an easy haul now, *Paul* !

Paul Bunyan, fabled in song and story for superhuman feats in the woods, would be amazed at the tremendous hauling jobs of today's trucks equipped with Spicer Fully-Synchronized Transmissions.

Hundreds of thousands of these heavy-duty Spicer Transmissions have been sold for original equipment and replacement service in logging, quarrying, oil fields, buses, earth-moving, and other essential industries which impose extreme punishment upon equipment. Motor transport, one of America's great industries, relies upon Spicer Fully-Synchronized Transmissions for economical, dependable service hauls—across a city or across the continent.

Spicer Transmissions have been produced since 1907. A Thomas Flyer using a Spicer Transmission established the first round-the-world automobile endurance record in 1908, spanning the United States, Asia and Europe on roads and paths that had never before seen a motor car.

Ask Dana engineers to demonstrate the many advantages of the Spicer *Fully Synchronized* Transmission to your heavy-duty needs in any field.

DANA

Spicer

SPICER PRODUCTS: Transmissions • Universal Joints • Propeller Shafts • Torque Converters • Axles • Powr-Lok Differentials • Gear Boxes • Power Take-Offs • Power Take-Off Joints • Rail Car Drives • Railway Generator Drives • Stampings • Spicer and Auburn Clutches • Parish Frames • Spicer Frames • Forgings

In-place balancing of a large vertical generator.

PINPOINT and REMOVE VIBRATION with a TINIUS OLSEN Vibrodyne BALANCER

For final check balancing of rotating assemblies, or for locating and removing mechanical vibration in installed equipment . . . you will do the job quicker and easier with the Tinius Olsen Vibrodyne.

This highly sensitive in-place balancer isolates the source of mechanical vibration for accurate detection and correction. Unlike other balancers, the Olsen Vibrodyne employs a tunable pickup. With a simple turn of its frequency control, the Vibrodyne becomes super sensitive to unbalance at the operating speed of the part in the range of 225 to 3600 rpm, using the standard pickup. Extraneous vibrations are effectively eliminated—assuring a finer, more accurate degree of balance. In fact, with an Olsen Vibrodyne, you "start" to balance where other units "stop."

Get the full story. Write today for 12-page Bulletin 53.

Trademark Reg. U.S. Pat. Off.

TINIUS OLSEN
TESTING MACHINE COMPANY
2090 EASTON ROAD • WILLOW GROVE, PA.
Testing and Balancing Machines

AI TABLOID

(Continued from page 37)

Davidson Rubber Co. recently celebrated 100 years of rubber fabricating with the opening of a subsidiary plant in Dover, N. H.

* * *

Aluminum Co. of America has made available a new sound motion picture on present and future design uses of aluminum.

* * *

Loewy-Hydropress Div. of Baldwin-Lima-Hamilton Corp. has been awarded a prime contract to design, build, and install a large ship motion simulator for the performance evaluation of the Navy's fleet ballistic missile.

* * *

Bassick Co. has developed a new boat trailer using adjustable Firestone air springs.

* * *

Pratt & Whitney Co., Inc. will move its Rochester office to the new Linden Industrial Park area of that city. . . . Timken Roller Bearing Co. has moved its Buffalo, N. Y. industrial and steel sales office to a new building at 2960 Main St.

* * *

Massachusetts Institute of Technology is holding courses in Missile Aerodynamics and Turbomachinery during the periods of June 24 to July 6 and July 1 to July 12, respectively.

* * *

Seiberling Rubber Co. has established a program to provide 14-in. diam wheels and tires for most makes of 1956-55-54 cars now equipped with 15-in. wheels.

* * *

General Electric Co. has disclosed that first application of its fuel-air combustion starter for jet engines will be the McDonnell F-101B jet fighter.

* * *

Passenger cars produced in Brazil will be 91 per cent made in the country in a little over three years. . . . Simca of France plans to open a plant in Brazil to produce the eight-cylinder Regence and Versailles cars.

* * *

Borg-Warner Corp. has licensed Adler Werke, vorm. Heinrich Kleyer AG, Frankfurt, to manufacture and sell B-W's overdrive in Germany.

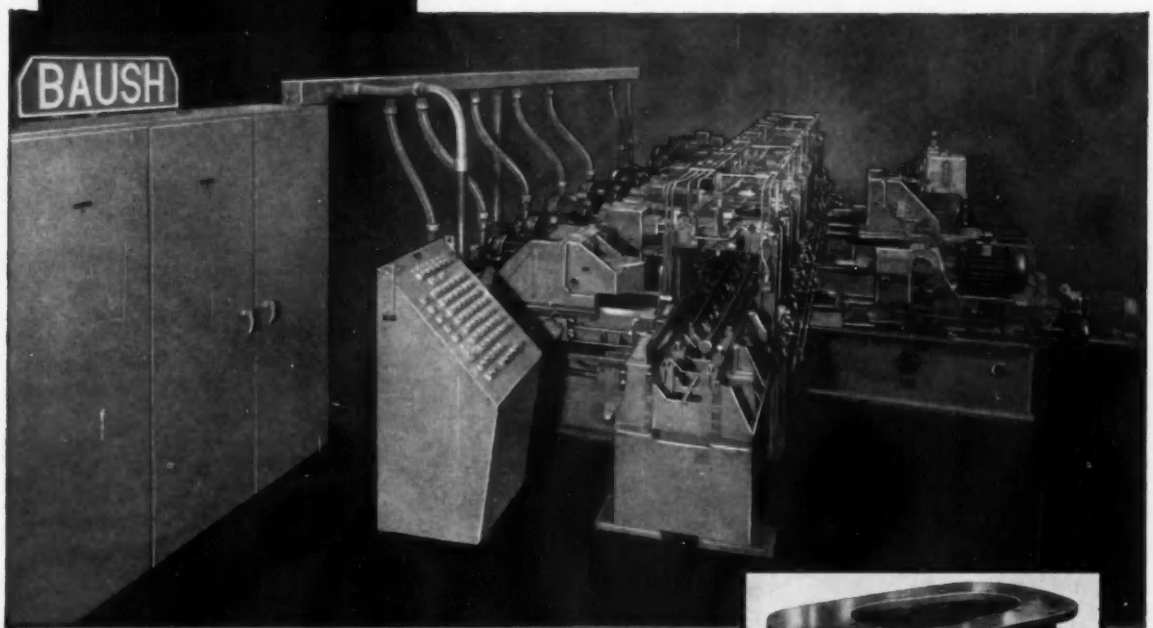
FOR USE IN GREAT BRITAIN

A 10 Station Baush Horizontal Automatic Transfer Line built for a leading British automobile manufacturer to perform operations on top and bottom of transmission case.

This 10-station horizontal transfer consists of —

- 1 Loading Station
- 1 Blow-off Station
- 7 Working Stations
- 1 Unloading Station

The transfer line is made up of 4 Horizontal Hydraulic Slide Units and 5 Horizontal Mechanical Leadscrew Units having 9 Fixed Center Heads equipped with a total of 32 spindles.



Operations performed are: Mill, Drill, Ream, Countersink, Chamfer and Tap. Individual leadscrew spindles are used for tapping and lubrication is by air-oil mist.

Production is 62 Transmission Cases per hour, or 1984 operations, working at 100% efficiency.

If it is rugged reliability, accuracy and economy of operation you are looking for in single purpose multi-spindle machine tools, then you want BAUSH MACHINE TOOLS.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

We know Baush can help — why not call us!

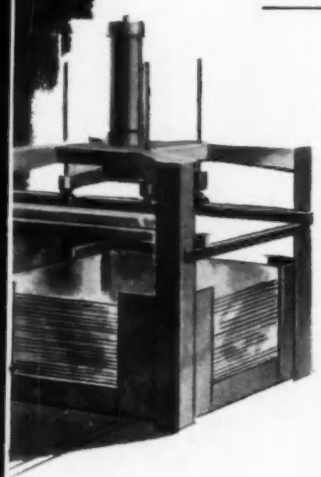
The Clearing Lead Press setup as shown above gives you maximum flexibility for current production. The feed is powered by the Lead press supplying automated production for the entire line. Since the feed is Transflex, many different parts can be produced by making simple adjustments of the feed fingers. An automated line like this is comprised of standard presses so that if future requirements demand a reorganized setup all the equipment can be utilized.

CLEARING PRESSES

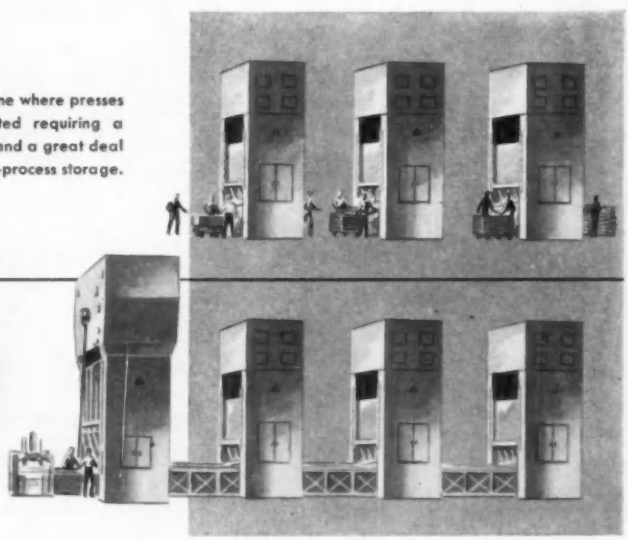
CLEARING MACHINE CORPORATION *Division of U. S. INDUSTRIES, Inc.*

LEAD PRESS

...another CLEARING Transflex concept that can help you automate production at MODERATE COST



Here you have a press line where presses are individually operated requiring a maximum of manpower and a great deal of parts handling and in-process storage.



Now add a Clearing single or double action

LEAD PRESS

and automate the entire setup for a relatively moderate investment in equipment.

Let's say you have a line of existing presses. Right now you're operating them individually with slide tables in between—or maybe you're running lift trucks with tote boxes all over the plant from operation to operation.

Here's a way to coordinate production and streamline the whole setup for more—a lot more—efficiency and economy. A Clearing Lead press equipped with a Transflex feed can reorganize your existing presses into a fully automated line. Hands off operation from start to finish and no trouble about job changeover either. A Transflex feed is readily adjustable to accommodate parts with varying dimensions. And, when necessary, you can move the automatic feed out of the way and run the presses independently again. Look into the Lead Press idea. Write or call Clearing for further information.

THE WAY TO EFFICIENT MASS PRODUCTION

6499 W. 65th Street • Chicago 38, Illinois • Hamilton Division, Hamilton, Ohio

CMC CLEARING USI

FOR ADDITIONAL INFORMATION please use reply card on PAGE 89

(*Continued from page 76*)

ing the clutch function, along with equipment showing where and how the clutch is used. *Formsprag Co., Booth 208.*

Circle 52 on postcard for more data

Bearings, Metal Parts

Exhibited in a combination display by three divisions of a company will be anti-friction bearings, precision metal parts, and rotary swaging machines. Featured in the bearing exhibit will be new drawn cup roller bearings, designed for high capacity with minimum space requirement, as described in AI, April 15, page 93. This section will also include needle bearings and self-aligning spherical roller bearings.

The Specialties Div., which makes precision metal parts to customer specifications, will show samples of current manufacture. Utilizing practically any wire stock, a variety of studs, shafts, rolls, perforating punches, pins, spindles and other special parts are being offered.

Working models of a recently redesigned rotary swaging machine, together with swaged parts, will likewise be on display. *The Torrington Co., Booths 15-17.*

Circle 53 on postcard for more data

MAXIMUM PERFORMANCE
MINIMUM MAINTENANCE

Through advanced design and creative engineering, BORG & BECK has stepped up the capacity of its passenger car clutches without increasing their over-all dimensions. Compact, light in weight, precision built—for maximum performance, minimum maintenance.

for that vital spot *where power takes hold of the load*

BORG & BECK CLUTCH THE STANDARD Reg. U.S. Pat. Off.

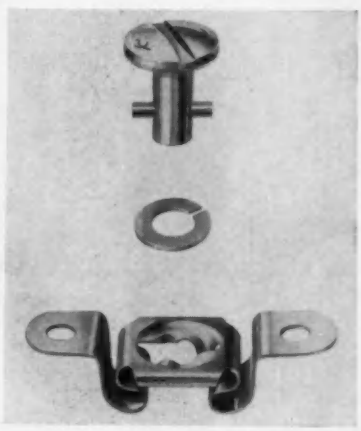
BORG & BECK

DIVISION OF BORG-WARNER

Chicago 38, Illinois

Quarter-Turn Fastener

Designed for use with thin materials and miniaturized equipment like airborne electronics, small electromechanical devices, and other light-



Camloc 5F series ¼-turn fastener

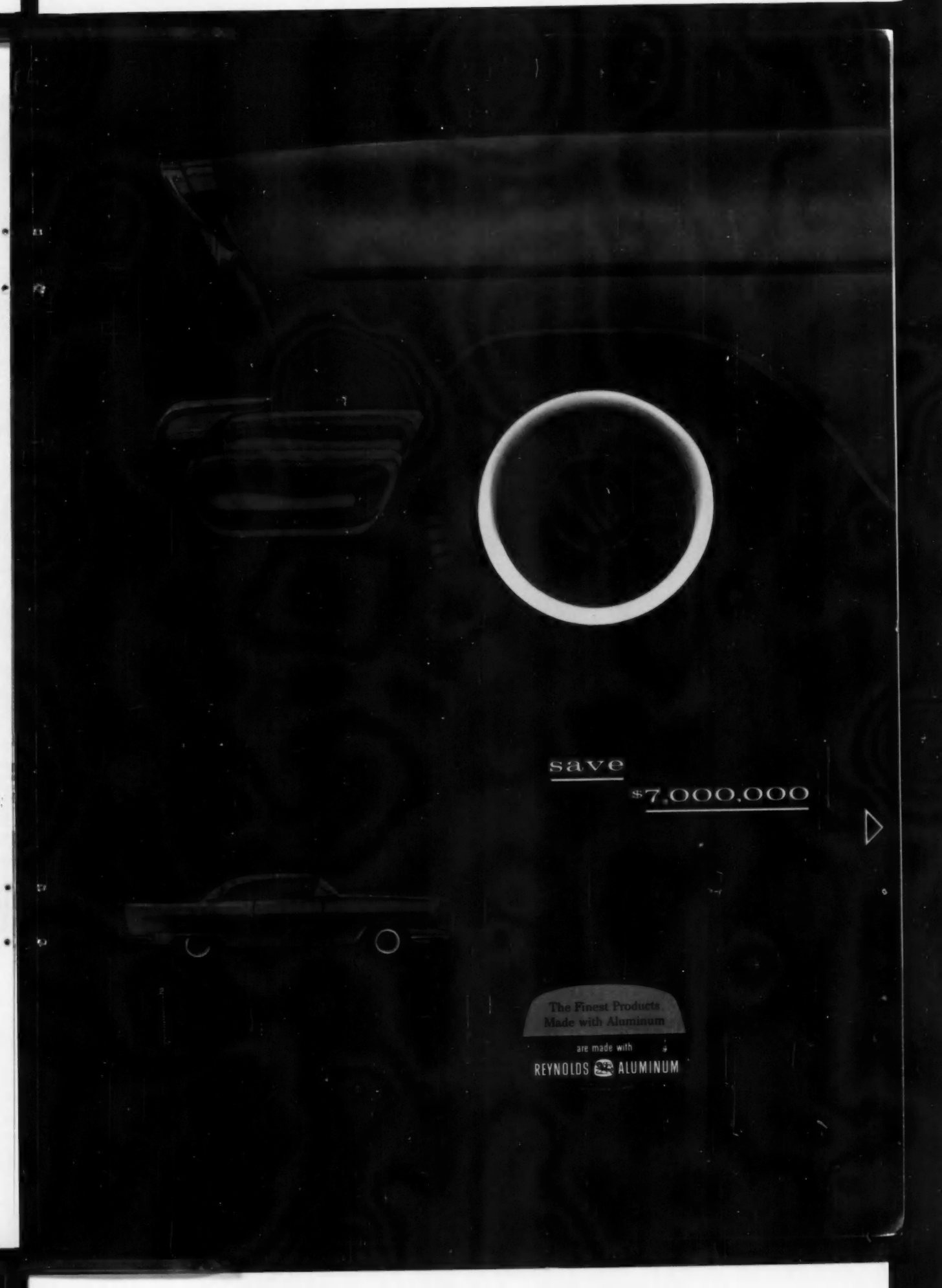
weight components, as well as for holding access panels, the new 5F series quarter-turn fastener will be offered at the show. Featuring a high strength to weight ratio, it is obtainable in a variety of head styles. *Camloc Fastener Corp., Booth 840.*

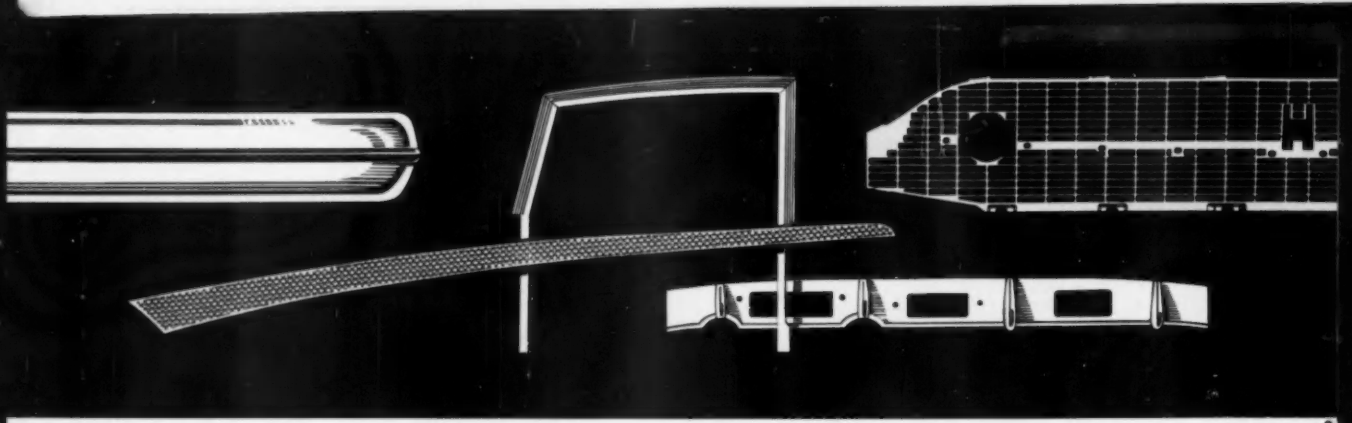
Circle 54 on postcard for more data

Roller Chain, Couplings

Several roller chain and sprocket, conveyor chain, and flexible shaft coupling applications, representing ten different industries, will be con-

(*Turn to page 145, please*)


save
$7,000,000
The Finest Products
Made with Aluminum
are made with
REYNOLDS ALUMINUM



ALUMINUM WHEEL COVERS can be fabricated and finished for 25¢ *per cover less* than a conventional finished steel cover. That's a saving of $1.00 per car. A saving for the industry of *seven million dollars every year*, based on estimated average automobile sales, 1957-1961, as reported in Fortune, November, 1956.

Aluminum wheel covers offer "bonuses", too. They are strong, lightweight, rustproof. And they can be color anodized with the "gleam of gold" or clear anodized with the "look of sterling". Either way you get gleaming chip-proof, flake-proof finishes that cost-wise or beauty-wise can not be duplicated in other metals.

Wheel covers are only one application where the automotive industry can cut costs, reduce weight, increase beauty by using aluminum. Grilles, instrument panels, emblems—all types of decorative trim inside and out—as well as countless motor parts, are proved applications for this modern metal. And for lighter, brighter tomorrows, aluminum bumpers, roof panels, rear decks

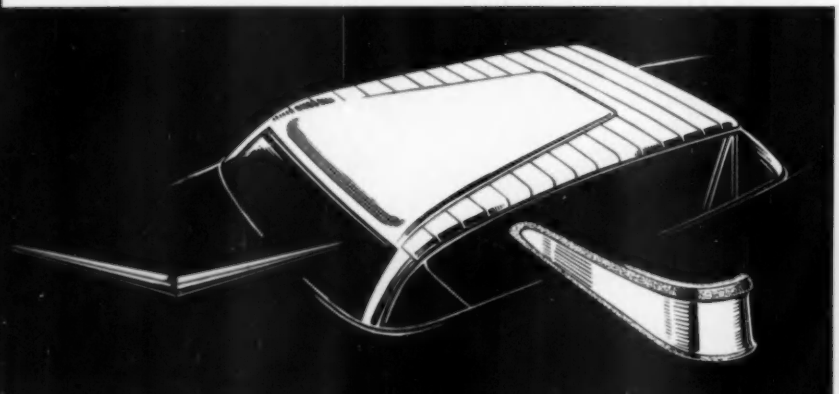
and hoods are already stimulating the imagination of the forward looking automotive industry.

For aluminum mill products or for fabricated aluminum parts and trim, Reynolds Aluminum Specialists will be glad to work with you to help you get the very most from the aluminum you use. For details, call the Reynolds Office listed under "Aluminum" in your classified telephone directory. Or write *Reynolds Metals Company, Fisher Building, Detroit 2, Michigan* or *P.O. Box 1800-MU, Louisville 1, Kentucky.*

NOTE: Before you buy any part—have it priced in aluminum. Basic material costs do not determine part costs. New techniques and processes—applicable only to aluminum—can give you a better product at a lower *final cost*.

See "CIRCUS BOY", Reynolds dramatic series, Sundays on NBC-TV

Reynolds Aluminum



The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

1957 DESIGN ENGINEERING SHOW

New York Coliseum
May 20-23

(*Continued from page* 142)

FOR ADDITIONAL INFORMATION
please use reply card on PAGE 89

tained in a permanent type display. A moving-conveyor lighted exhibit will show samples of the company's standard products, which include finished steel roller chain and attachments, stainless steel and bronze roller chain, sprockets, and flexible shaft couplings. *Diamond Chain Co., Inc., Booth 1720.*

Circle 55 on postcard for more data

Miniature Parts

More than 50,000 samples of miniature zinc alloy die castings and precision molded thermoplastic parts will reportedly be on display in an exhibit. They will range from toy and souvenir articles, to gear-and-pinion combinations, distributor point rubbing blocks of nylon, electric switch parts, and electric controls, among others. Case histories of tiny die-casting and molded parts' applications will be an added attraction. *Gries Reproducer Corp., Booth 421.*

Circle 56 on postcard for more data

Industrial Brakes

Introduction of a new line of electro-magnetic brakes for industrial applications will be made at the show. Designated Power-Safe brakes, they are said to combine high torque and fast cycling with ability to hold or stop a load if power fails. Four basic sizes are currently listed as standard, with other sizes to be added in the future as required. Power torque

(*Turn to page* 148, *please*)

TRU-O-SEAL
TEFLON SEAL
PAT. PENDING

STOPS PIPE THREAD LEAKS

Satisfaction Guaranteed Or Money Back TRIAL OFFER

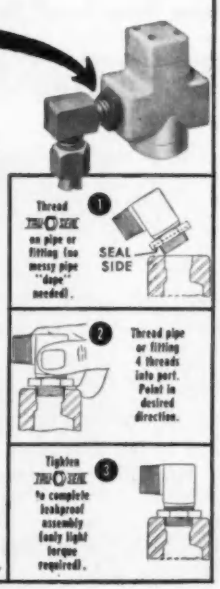
TRU-O-SEAL Fittings are guaranteed to seal pipe thread connections permanently against all oils, practically all known chemicals and gases; to seal under high pressures or vacuum; to withstand —280° to plus 500° F.; to eliminate "overtightening" damage and pipe dope. Available in ⅛" to 2½" pipe thread sizes.

$10.00 Trial Offer No. 1: eight ⅛", ten ¼", eight ⅜", ten ½" pipe thread TRU-O-SEAL Fittings.

$10.00 Trial Offer No. 2: eight ½", ten ¾", four 1" pipe thread TRU-O-SEAL Fittings.

Send order to

TRU-O-SEAL DIVISION
Flick-Reedy Corporation
2028 N. Hawthorne Melrose Park, Ill.
"Miller Fluid Power" is also a Div. of Flick-Reedy Corp.


1 Thread TRU-O-SEAL on pipe or fitting (no messy pipe "dope" needed).
SEAL SIDE
2 Thread pipe or fitting 4 threads into port. Point in desired direction.
3 Tighten TRU-O-SEAL to complete leakproof assembly (only light torque required).

BUY BONDS

need fasteners IN A HURRY

Southern Screw stocks over One Billion fasteners — ready for shipment in as little as five minutes if your order needs Southern's rush service.

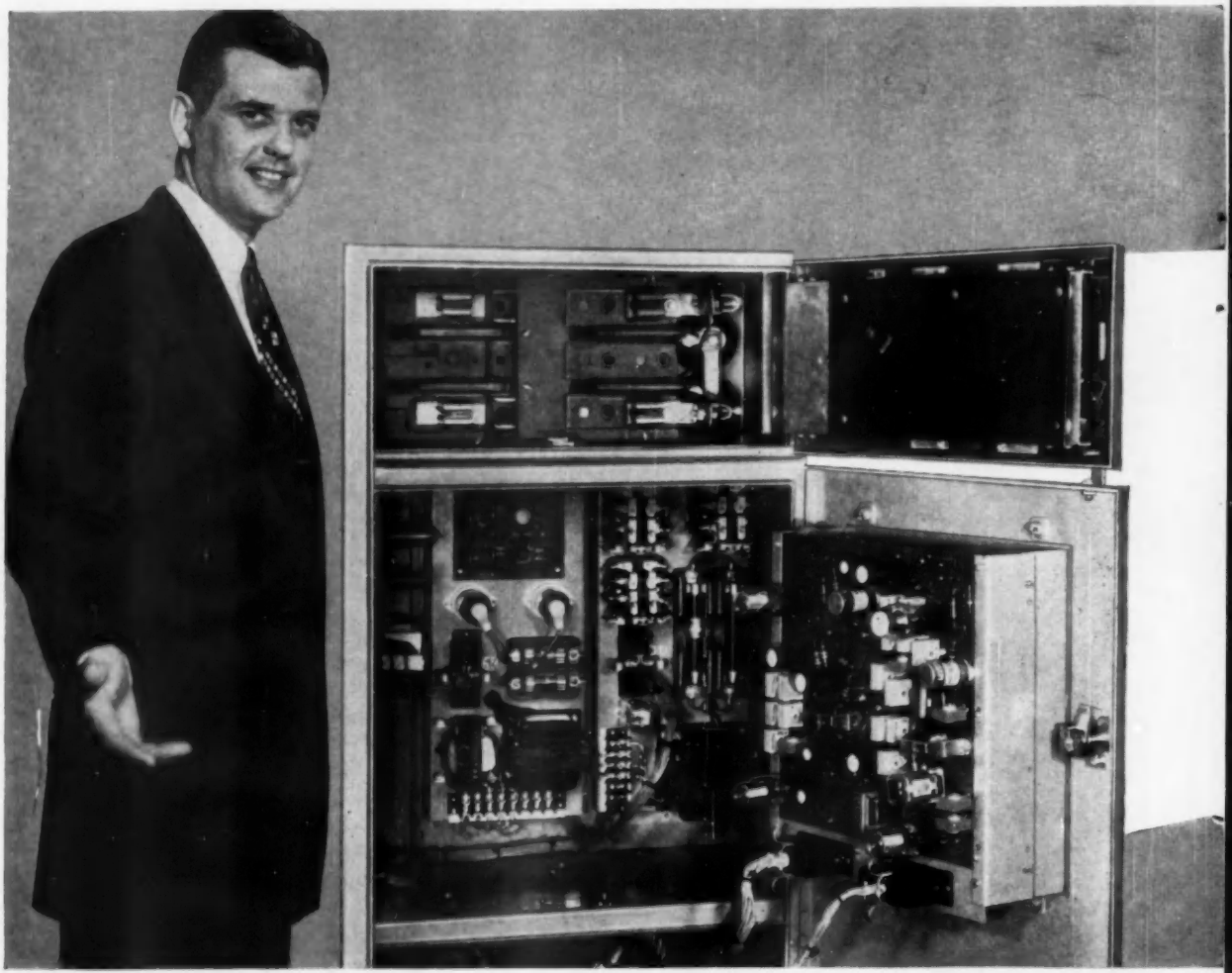
Southern fasteners are famous for quality. You can't buy better screws or bolts at any price!

Send today for your copy of Southern's Warehouse Stock Guide for the warehouse nearest you. Include information about the styles and sizes of fasteners you are now using and we will be glad to see that you receive a prompt quotation. Write or wire Southern Screw Company, P. O. Box 1360-AI, Statesville, North Carolina.

Wood Screws • Machine Screws & Nuts • A&B Tapping Screws • Dowel Screws • Wood & Type U Drive Screws • Stove Bolts • Roll Thread Carriage Bolts • Hanger Bolts

Southern SCREW COMPANY
STATESVILLE • NORTH CAROLINA

Warehouses:
NEW YORK • CHICAGO
DALLAS • LOS ANGELES



600 WELDS PER

with the new WESTINGHOUSE

The Westinghouse Weld-O-Timer*— the automotive industry's most advanced resistance welding control—combines record-breaking performance with outstanding dependability. The excellent characteristics built into the Weld-O-Timer can mean the difference between continuous high production and profit-eating down time.

The New Weld-O-Timer Features . . .

Printed Circuits for absolute dependability, easy inspection, and minimum maintenance.

Lightweight, Plug-In Panels for faster servicing—all or any panels replaced in less than three minutes!

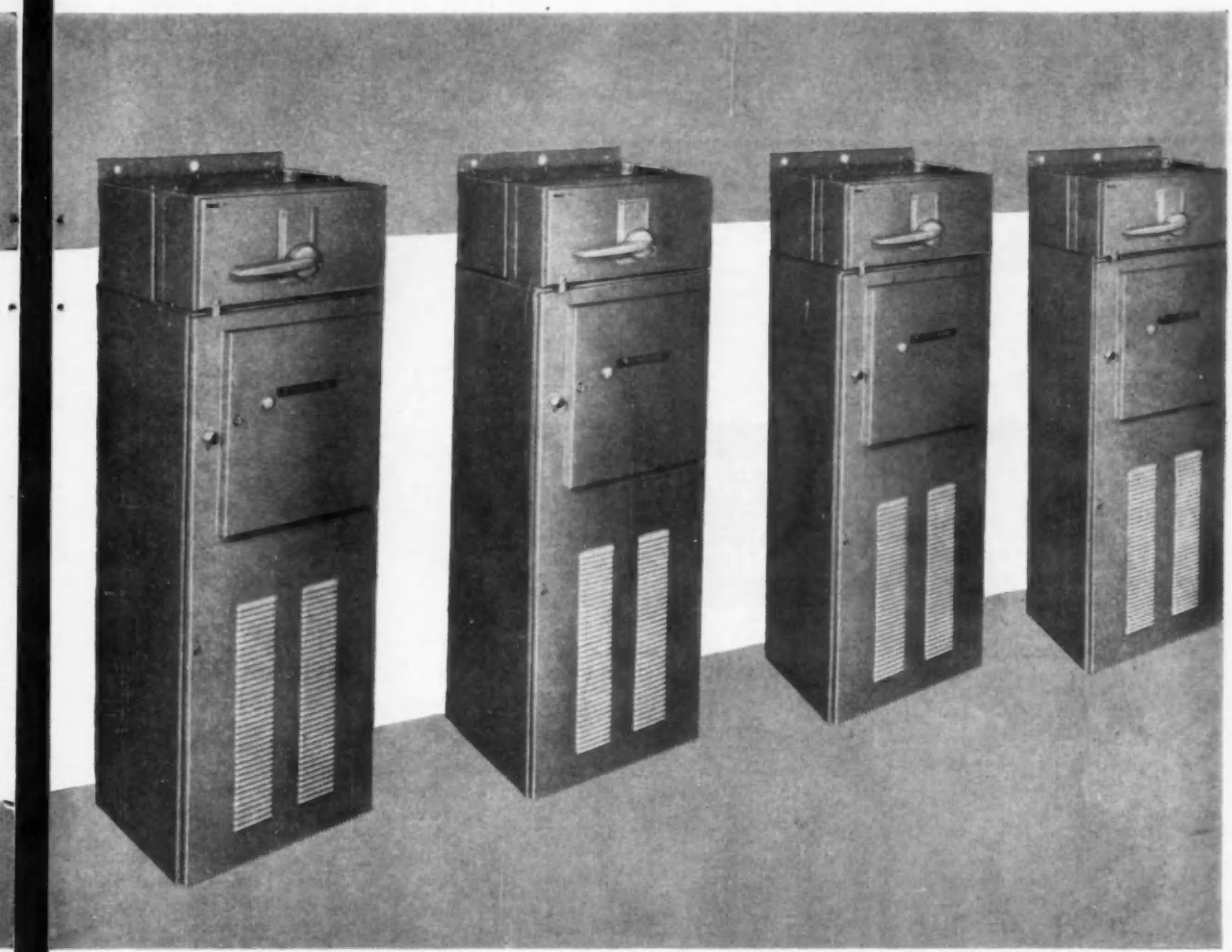
Weld-Safe Protection for foolproof protection of the machine, expensive dies and material.

Longer Life Components for 20% longer life of the control unit!

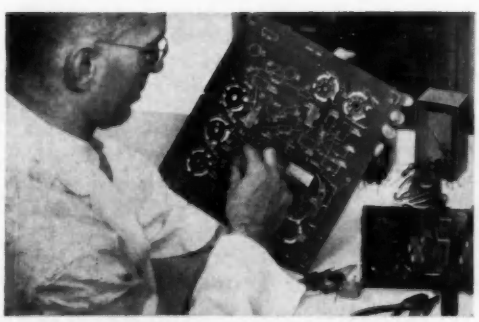
For more details on this outstanding automotive resistance welding control, call your local Westinghouse representative, today. Or write, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

*Trade-Mark
J-22007

YOU CAN BE SURE...IF IT'S Westinghouse



MINUTE POSSIBLE
WELD-O-TIMER



Printed Circuits . . . among the newest wiring techniques . . . have resulted in the elimination of 27 feet of interconnecting wire, and make the possibility of cold solder joints a thing of the past.

- Plug-in panels
- Dual gun and dual sequence
- Initial squeeze delay
- Negative hold time
- Platen delay
- Foot switch attachments
- Air Valve connections
- Fusible disconnect
- Tube firing for Hypersil core transformers

These Special Features—incorporated in the automotive Weld-O-Timer, match high-speed production with minimum down time and maintenance. The Weld-O-Timer is also built to meet J. I. C. Specifications.

1957 DESIGN ENGINEERING SHOW

New York Coliseum
May 20-23

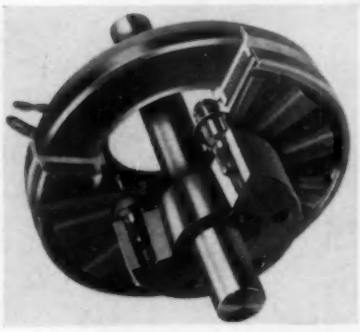
(Continued from page 145)

FOR ADDITIONAL INFORMATION
please use reply card on PAGE 89

ratings range from 125 to 650 lb-ft and fail-safe torque ratings from 33 to 205 lb-ft. Models are also available that provide the fail-safe feature with electrical release but without power braking. Basic model designations are PER-825, 1000, 1225, and 1525.

Maintenance cost is minimized because the only parts which wear are the replaceable face and armature. The brakes are self-adjusting for wear, and have no bands, links, cams or adjusting screws. Compactness of design is also featured. *Warner Electric Brake & Clutch Co., Booth 1636.*

Circle 57 on postcard for more data



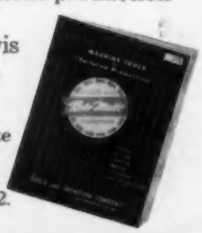
Cutaway view of Power-Safe brake

Double End Threading of 280 Shafts per hour

. . . with Davis & Thompson Roto-Matic and Automatic Ejection

Here's another example of Davis and Thompson Engineering of high production with a minimum of equipment. This GG-8 horizontal threader is equipped with 4 spindles in each head and a 4 station fixture. It is one of countless threading machines that have been designed and built by Davis & Thompson since 1924. Both single and double end machines for pipe, conduit, shafts and similar parts in various production quantities have been produced.

If you have work of this nature, call in a Davis & Thompson Representative. There is no obligation for this service.



ADDITIONAL INFORMATION Get the complete story of the facilities available from Davis and Thompson. Write for this 8-page booklet today. Ask for Bulletin #1002.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. . . . MILWAUKEE 10, WISCONSIN

Extruded Bar Stock

Applications for hot-extruded cold-drawn bars will be featured in an exhibit, which will demonstrate how milling and machining operations may be reduced or completely eliminated by the use of this stock. The applications range from fire arm parts to helicopter rotor blades. The display will show a step-by-step process by which a bar of steel is extruded and then cold-drawn to close tolerances. *Jones & Laughlin Steel Corp., Booth 237.*

Circle 58 on postcard for more data

Gasket Materials

The new expanded line of flexible Accopac asbestos gasket materials for all types of industrial use, will be included in a group of fiber sheet, cork and rubber, rubber and cork composition gasket materials to be shown. Also displayed in this exhibit will be friction materials for clutch plates, seamless rubber belts and feed rolls; vibration-damping asphalt-saturated felts; and adhesives of various types. *Armstrong Cork Co., Booths 509-511.*

Circle 59 on postcard for more data

Power Transmission Units

Highlighted in an exhibit will be a company's complete line of power transmission and conveying equipment. Of interest to design engineers will be an operating display of P.I.V.

(*Turn to page* 150, *please*)

WHAT IS YOUR PARTS PROBLEM?

The RIGHT solution can save you money

. . . and chances are, Aetna can provide it. Many of the production and application problems of parts which are troublesome to you today, may have already been successfully studied and resolved by our design and application engineers. From hundreds of case histories they can give you valuable counsel—help you make certain that the vital parts that go into your products will provide the dimensional accuracy and stability so essential for sustained peak efficiency and longest life expectancy.

Versatile facilities enable Aetna to do a complete job in parts for O.E.M. customers—from research through manufacturing—with all the advantages of single source control and responsibility. Why not outline YOUR parts problems for our study and proposals.

AETNA BALL AND ROLLER BEARING COMPANY

Division of Parkersburg-Aetna Corporation

4600 Schubert Avenue • Chicago 39, Illinois

IN DETROIT—SAM T. KELLER, 1212 FISHER BUILDING

Aetna

Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Radial Ball Bearing Mounted Units • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Miscellaneous Parts

USE PRINTED Shuford's SHURTAPE®

...identify parts and accessories FAST!

Printable Shuford's SHURTAPE FP-17 is a pressure-sensitive flat back paper tape . . . ideal for use in labeling metal, wood, glass or plastic parts and accessories for quick and easy identification.

This economical-to-use tape is flexible and strong . . . adheres instantly and can be removed quickly and easily. Resists abrasion, water, solvents and oil.

Shuford's SHURTAPE FP-17 comes in white, blue, green, yellow, orange, red, silver and natural color. Have your identification numbers printed on Shuford's SHURTAPE and label parts and accessories for quicker handling, fewer errors and easier storage.

For complete information, write

CLOTHES LINES • TWINES
PRESSURE-SENSITIVE PAPER TAPES
SASH CORDS • WEATHER STRIPPING
COTTON & RAYON YARNS • EXTRUDED PLASTICS

Shuford SINCE 1880 Mills, INC
HICKORY, N. C.

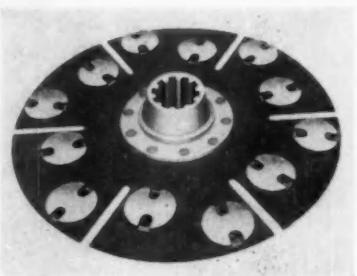
World's Largest Manufacturer of Cotton Cordage

variable speed drives, the new Motogear, and self-aligning bearings. In addition, there will be a display of ball and roller bearings; babbitted bearings and take-ups; and roller, silent and other chains used for power transmission. Visitors to the booth will also see the latest geared flexible coupling line. *Link-Belt Co., Booth 31.*

Circle 60 on postcard for more data

Clutch Plates, Linings

Featured in one booth will be new lines of button-type clutch plates and all-metal brake blocks. The clutch plates, intended primarily for industrial crawler tractors and other types of earth-moving equipment, are fitted with multiple buttons faced with a friction material made from sintered



Wellman button-type clutch plate

copper and wear-controlling ceramic elements. The buttons are not encased in a steel cup and only the friction material is in contact with the pressure plate and flywheel.

The all-metal brake blocks, designed for heavy-duty motor transport and off-the-highway equipment, are made from powdered ferrous metals and refractory elements. They are said to show no fade under severe operating conditions, to be unaffected by moisture or grease, and to require fewer adjustments. *The S. K. Wellman Co., Booth 12.*

Circle 61 on postcard for more data

Truck Builders Help Promote Tubeless Tire for Heavy Units

Several truck builders are giving tire companies a hand in promoting tubeless tires on heavy units. One offers tubeless tires to select operators on a free trial basis, guarantees to replace them with conventional casings at no cost if they don't work out. Heavy haulers have been hardest to sell on tubeless.

Giant LeTourneau Sno-Freighter built on rugged backbone of SHELBY SEAMLESS MECHANICAL TUBING

Another LeTourneau "train," also constructed with Shelby Seamless Mechanical Tubing, maneuvers through the streets of Longview, Texas. The uncovered control car reveals its 3,500-gallon fuel tank and its two diesel engines which generate electricity for driving the wheel motors.

Sno-Freighter in action in northern Alaska. The control cab is 17 feet high; the decks of the cargo carriers are 8½ feet high. Speeds range from 0 to 15 MPH.

The LeTourneau Sno-Freighter is a huge six-section cargo carrier specifically designed to travel over ice, frozen or compacted snow, bull-dozed trails, or rough brush land. It is presently in active use hauling fuel and other strategic materials to radar stations along the Arctic Coast.

The Sno-Freighter "train" consists of a power control car and five cargo cars, each with a capacity of 25 tons. Two 400 H.P. diesel-electric generating sets on the power control car supply electrical power to the 24 drive wheels, each of which has a powerful electric motor tucked into its rim. Thus, each wheel drives independently of the others, making it practically impossible for the carriers to get stuck in sand, snow, or swamp.

All of the Sno-Freighter's car frames are constructed of Shelby Seamless Mechanical Tubing in diameters from 2 inches to 8 inches. In addition, each of the cars is coupled to the one preceding it through a universal joint and a long steel tube of Shelby Seamless. This constitutes the steering mechanism, causing each vehicle automatically to track the car ahead of it. The operator of the Sno-Freighter steers only the two front wheels of the power control car.

There are many good reasons why Shelby Seamless Mechanical Tubing was chosen for the supporting framework of this magnificent mechanical marvel. Primarily, it offers the ultimate in strength and rigidity in proportion to its size and weight. Secondly, it is shock-absorbent, uniform throughout, dimensionally accurate, and possesses excellent machining and superior welding properties. It is produced under rigid standards, and is available in a generous range of diameters, wall thicknesses, various shapes and steel analyses. And it can be fitted to your specifications, regardless of what they are. Contact our engineers. They will be happy to help you adapt Shelby Seamless to your requirements.

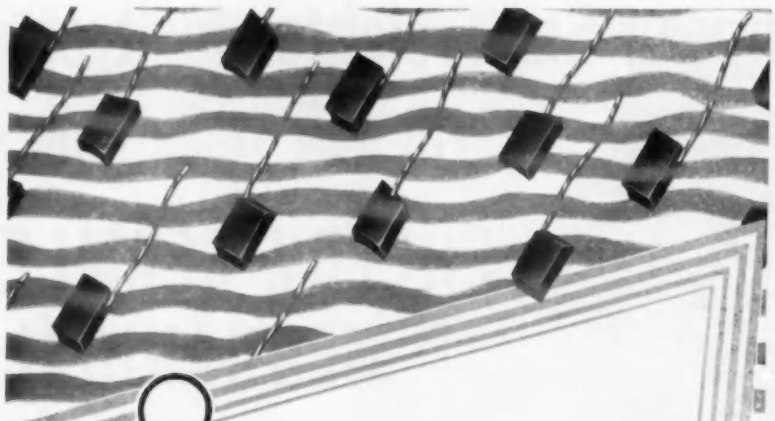
NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

SHELBY SEAMLESS MECHANICAL TUBING

WALLS WITHOUT WELDS

UNITED STATES STEEL



Now!

Long-Life Brushes

FOR FUEL PUMP MOTORS

Meet the first truly long-life brushes for 12-volt fuel pumps!

Typical of Stackpole brushes designed for specific operating conditions, these new units combine excellent commutation with long life in gas fume-laden atmospheres or immersed in gasoline, which prohibit proper commutator filming by conventional brushes.

Stackpole's chief stock in trade is its ability—based on half a century's experience—to match brush grades to on-the-job operating conditions.

The fact that more cars on the road today use Stackpole ignition system brushes than any other make offers additional evidence along these lines.

STACKPOLE CARBON COMPANY
St. Marys, Pa.

STACKPOLE

50 Years of Carbon-Graphite-Metal Powder Progress

Other Stackpole products include Electrical CONTACTS • CERAMAGNET® Ceramic MAGNETS • VOLTAGE REGULATOR DISCS • SEAL RINGS • PUMP VANES • FRICTION SEGMENTS • CARBON BEARINGS • MOLDS and DIES • WELDING and BRAZING CARBONS • FIXED and VARIABLE RESISTORS and many more.

MACHINERY NEWS

(*Continued from page* 80)

or slightly exceed the amount of attrition on the wheel due to the work accomplished.

European Welding

Dr. Gregory Blanc, director of research for Eutectic Welding Alloys Corporation's European affiliate, Societe des Soudures Castolin, Lausanne, Switzerland, has completed a U. S. lecture tour. He reported Europe's metallurgical progress to MIT, Case Institute,

Dr. Gregory Blanc, Eutectic's European director of research.

University of Michigan and led welding conferences with Battelle Institute and with the engineering staffs of such organizations as Ford, General Electric, and Sorel Industried in Canada. One of the lectures Dr. Blanc delivered "Experimental Determination of Bonding Temperatures" covered the recent work he directed and which has enabled Castolin and Eutectic to develop new low melting alloys.

BOSA Faces Axe

Proposed elimination of the Business and Defense Services Administration industry divisions would write finish to a lot of programs industry has in the past

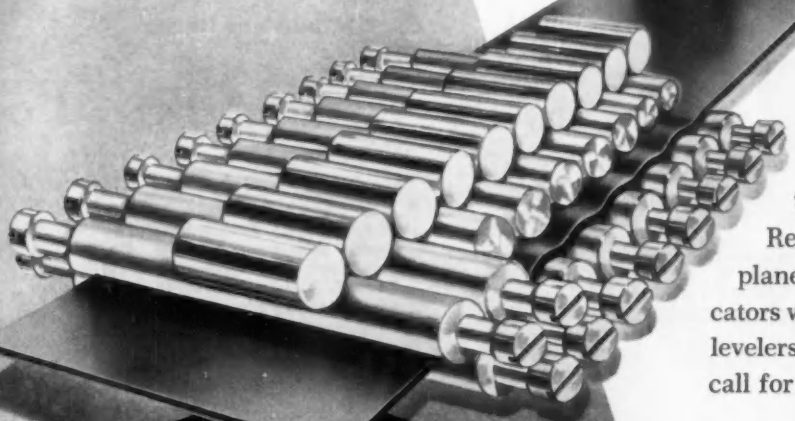
(*Turn to page* 156, *please*)

SHELBY SEAMLESS MECHANICAL TUBING

UNITED STATES STEEL

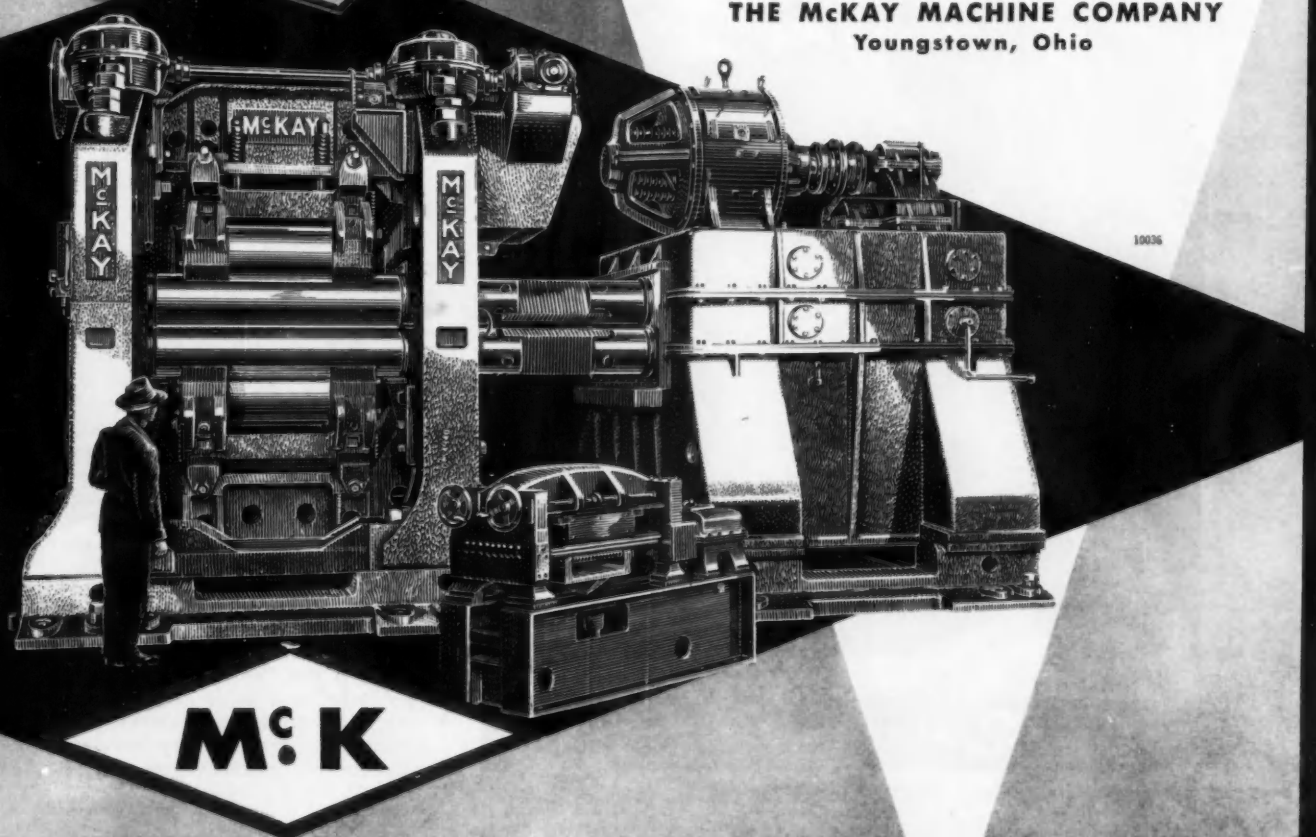
McKay ROLLER LEVELERS

. . . From Tin Plate to Ship Plate



Tin cans and super-tankers have more in common than cargo space — the flat steel of which they're made had to be roller leveled. Regardless of the product — cans, cars, planes, appliances or ships — more fabricators will tell you that the "buy-word" in roller levelers is McKay. Write for Bulletin 100, or call for a McKay Application Engineer today.

THE McKAY MACHINE COMPANY
Youngstown, Ohio



McK

SETTING THE STANDARDS OF QUALITY METAL WORKING MACHINES FOR TWO GENERATIONS

DESIGN ENGINEERING SHOW—CONFERENCE PROGRAM

(*Continued from page 70*)

WEDNESDAY, MAY 22, 9:30 AM

THREE CONCURRENT SESSIONS

MECHANICAL SESSION **Chairman—Harold Sizer, Director of Design for Machine Tools, Brown & Sharpe Manufacturing Co., Providence, R. I. Vice-Chairman—William C. Allen, Director, Manufacturing and Equipment Engineering, Westinghouse Electric Co., Pittsburgh.**

DESIGNING FOR EASIER MACHINING, HANDLING AND ASSEMBLY

Kurt O. Tech, Vice-President in Charge of Engineering, Cross Co., Detroit.

HOPPER FEEDING

Floyd E. Smith, President, Perry Equipment & Engineering Co., Erie, Pa.

MATERIALS SESSION **Chairman—Carl Massopust, Director of Research and Development, Plastics Division, General American Transportation Corp., Chicago. Vice-Chairman—Donald R. Meserve, Products Manager, Organic Coatings, Metal & Thermit Corp., New York.**

PLASTICS AND RUBBERS

Wyman Goss, Manager, Phenolics Engineering, Chemicals Materials Department, General Electric Co. Pittsfield, Mass.

COATINGS AND FINISHES

H. J. Reindl, Supervisor, Research and Development, Finishes Section, Inland Manufacturing Division, General Motors Corp., Detroit.

ELECTRICAL SESSION Chairman—Dr. Cuthbert C. Hurd, Director of Automation Research, International Business Machines Co., New York. Vice Chairman—John Randall, Assistant Director, Manufacturing Engineering Office, Ford Motor Co., Dearborn, Mich.

NUMERICAL CONTROL FOR MACHINERY

Claud D. Coffin, Senior Electrical Engineer, Warner & Swasey Co., Cleveland.

DESIGNING MACHINE TOOLS FOR AUTOMATIC CONTROLS

C. B. Sung, Manager, Mechanical Development Section, Research Laboratories Division, Bendix Aviation Corp., Detroit.

• • •

Guidance for thousands of small manufacturers in carrying out preparations for continuing plant production or restoring it in event of a nuclear attack is contained in a new publication issued by Business and Defense Services Administration. The publication, entitled "Industry Planning for the Continuity of Production in the Event of Enemy Attack," may be obtained without charge from Business and Defense Services Administration, U.S. Department of Commerce, Wash., D. C.

•

Fast tax amortization is down, but it is not out. Administration wants to hang on to its basic authority to authorize fast write-offs, although at present very few certificates of necessity are being issued.

GOSHEN
GORBOND*
*Trade name for Goshen's exclusive bonding process.
sets a new standard of excellence in
RUBBER-TO-METAL ADHESION
developed and offered exclusively by
Goshen Rubber

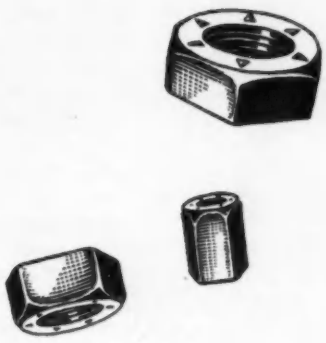
If your problem is finding really dependable adhesion of a rubber compound to metal, then Goshen's exclusive bonding process, GORBOND, is for you. Parts made of natural, synthetic and silicone rubber compounds are being regularly bonded securely to metals of most every type . . . in a manner to meet the most exacting tolerances as well as material and performance demands. This superior process allows engineers wider freedom to employ the simplified design and lowered end costs possible through rubber-to-metal bonding of unexcelled reliability.

Write for Technical Bulletin No. 9

See our catalog in Sweet's Product Design File.

PUT Goshen Rubber TO WORK FOR YOU

GOSHEN RUBBER CO., INC., 2757 S. TENTH ST. GOSHEN, IND.

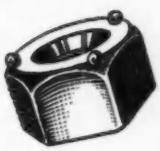


For over 50 years, leading manufacturers in all the major industries have used Gripco lock nuts to simplify production, lower manufacturing and maintenance costs and to improve the durability of all kinds of assembled products. To maintain this enviable reputation for outstanding product quality, the Grip Nut Company of South Whitley, Indiana, uses quality-controlled Youngstown Scrapless Nut Wire and Bars as basic raw material.

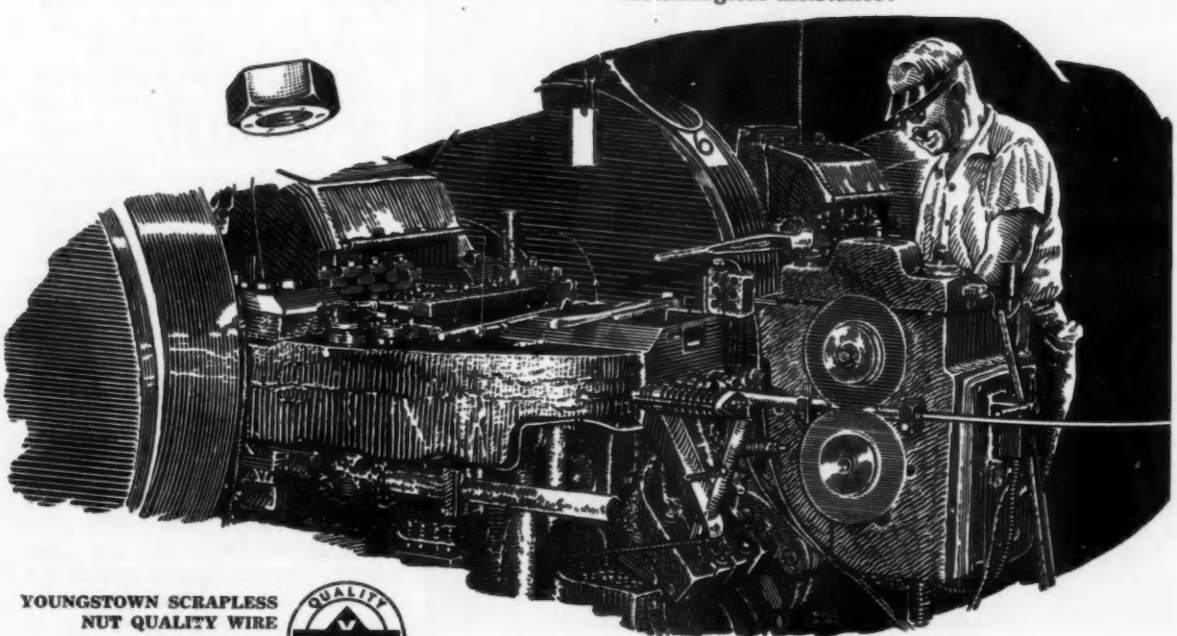
Because it comes to your plant free from all piping, injurious seams, laps, die marks, internal tearing and cupping, and non-metallic inclusions —Youngstown Scrapless Nut Quality Wire will provide increased production with fewer rejects which adds up to a healthy over-all profit boost. Also, its smooth coating extends die life thus minimizing costly die replacements.

YOUNGSTOWN SCRAPLESS NUT WIRE

Helps Maintain Quality of GRIP *Lock Nuts*



Youngstown Scrapless Nut Quality Wire is provided in special resulphurized steels as well as in standard AISI grades. Cold Heading Bolt Wire, of the same high Youngstown quality, is also available in all standard carbon and alloy analyses. Why not phone or write to our nearest District Sales Office for additional information or metallurgical assistance?



YOUNGSTOWN SCRAPLESS NUT QUALITY WIRE

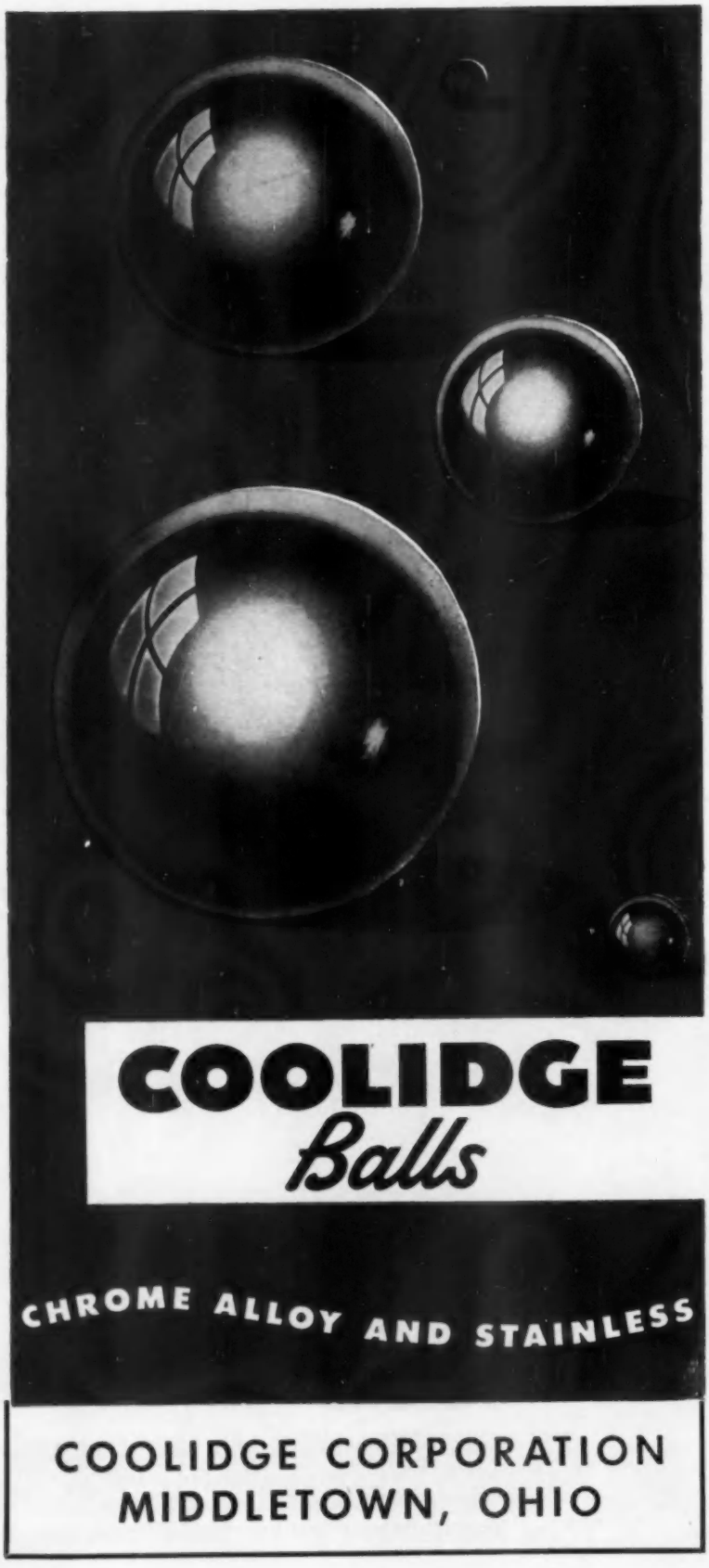
QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio

District Sales Offices in Principal Cities



MACHINERY NEWS

(*Continued from page* 152)

supported. Whether or not these programs are to be continued in the year beginning July 1 is now up to the Senate.

In the Metalworking Equipment Division alone, the important tool and die directory, still "many months" away from completion, would never be finished. Similarly, the machine tool trigger program, with some 70 contracts now signed, representing about 85 percent of affected machine tool manufacturers would fall apart, Government officials believe.

It has been said in mobilization circles that if the Congress goes through with the elimination of the industry divisions, their functions could be pushed into the Defense Department and operated at least on a part-time basis.

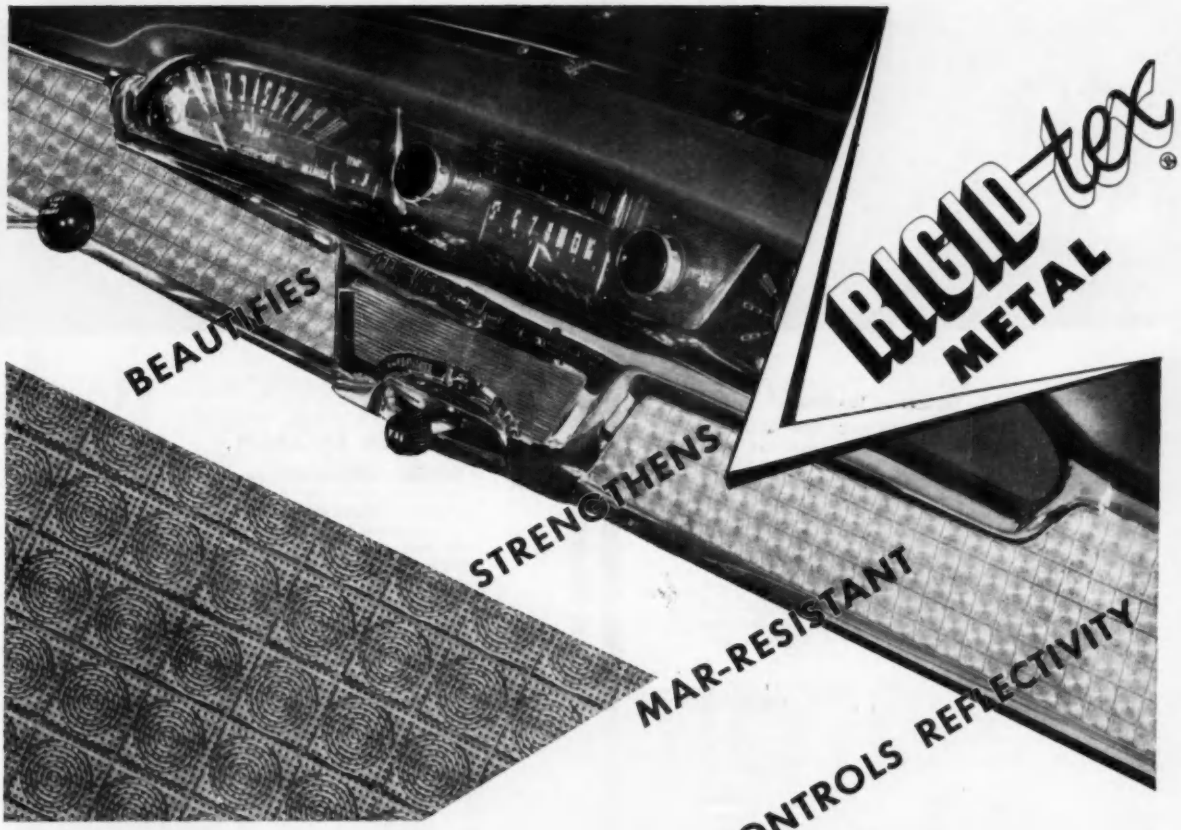
ASTE Tool Shows

A national Tool Show, sponsored by the American Society of Tool Engineers, will be held in Detroit every other year beginning in 1960 with the opening of Detroit's Exposition Hall in the new Civic Center. This decision was reached by ASTE's Board of Directors at the March Silver Anniversary Meeting of the Society. The Detroit schedule will dovetail with ASTE's present biennial Tool Shows, currently held regularly every other year in either Chicago or Philadelphia. Under the new arrangement the ASTE Tool Shows will be held on an annual basis (after 1960) with Detroit as the location every other year. Thus, the shows will be held in Philadelphia in 1958, Detroit in 1960, Chicago in 1961, and in Detroit in 1962.

Reds Get U. S. Designs

Machine tools of American design can be shipped behind the Iron Curtain as long as they're made in a foreign country of foreign materials. The U. S. Export Control Act prohibits shipments of U. S. machine tools to the Russians. It permits shipments of plans, drawings and technical data

(*Turn to page* 162, *please*)



Aluminum RIGID-tex Metal Perforated, Pattern — C-i-S
Shown Actual Size

and the Big News is Color!

The instrument panel of this modern car is RIGID-tex Metal, curved to follow the contour of the wrap-around windshield. As shown in the full-size pattern reproduction above, the RIGID-tex Metal is perforated. This permits any portion of the instrument panel to be used for the speaker grille. It has excellent tone and volume transmission properties because it does not accumulate sound deadening dust. The pattern upsets the perforations, providing better sound dispersion.

RIGID-tex Metal is ideal for instrument panels. Its beautiful, textured, mar-resistant surface breaks up reflected light into small geometric patterns which are eye-pleasing in contrast to the blinding glare reflected from flat metal.

And now RIGID-tex offers both texture and color, in one easily fabricated metal. The added scintillating beauty these patterns attain with the magic of color must be seen to be appreciated. The sparkling highlights, the richness of colored shadows, paints a picture in metal that varies with the light by which it is viewed. Now at long last RIGID-tex Metal makes it possible to bring enduring color to the instrument panel and other sheet metal parts to match interior décor of modern cars, with beauty and texture that catches the eye and sets the buying mood.

RIGID-tex Metal is available in any metal... any finish... any color, solid or perforated. There are more than 40 standard patterns from which to choose and new patterns are constantly being developed.

RIGID-tex METAL® IT'S RIGIDIZED

See Sweet's Design File 1a/Ri or write us for information.

RIGIDIZED METALS CORPORATION

6715 OHIO STREET, BUFFALO 2, NEW YORK

SALES REPRESENTATIVES IN PRINCIPAL CITIES

"Engineered Production" Service

FOR BROACHING

It takes all 3

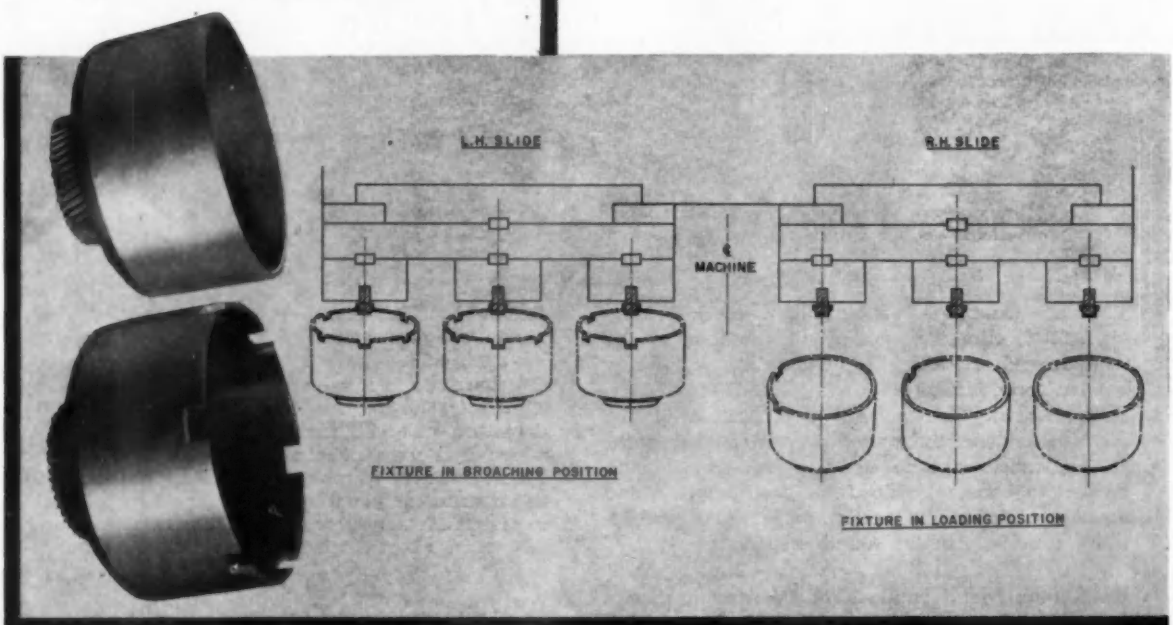
American's *"Engineered Production"* Service . . . gives the broach-user the complete three-part service that is essential to obtain the most practical broaching method. Years of design and production engineering experience, unavailable at any price, are effectively added to your staff at no extra cost.

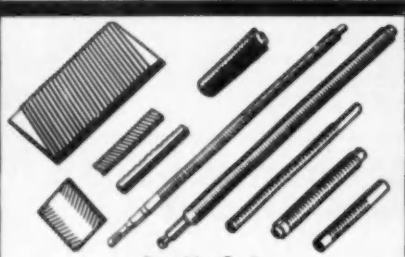
THE JOB — Broaching six .602 - .606 inch wide, .38 inch deep slots in the face of a 5.5 inch diameter hub. The bottom face of the slot is finished at an angle.

THE RESULT — 150 completed pieces per hour. Two automatically indexing, three-station fixtures hold the six parts. The operator has only to load and unload parts and start machine cycle.

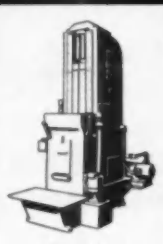
1 PROPER BROACH TOOL DESIGN

Top-quality results on any broaching operation require starting the job with design of the broaching tool itself. In solving this all-important first step, American Broach considers stock removal, length and width of cut, finish, tolerances required, etc. American's experience in designing and building broaches for every type of part capable of being broached pays off in quality of work and in long tool life. You can be sure the broach and machine will operate as a team because they are designed that way.

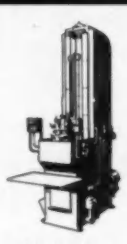




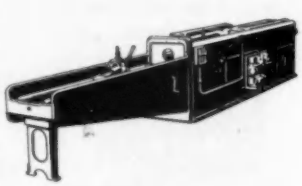
Broaching Tools



Three Way



Single Ram



Horizontal

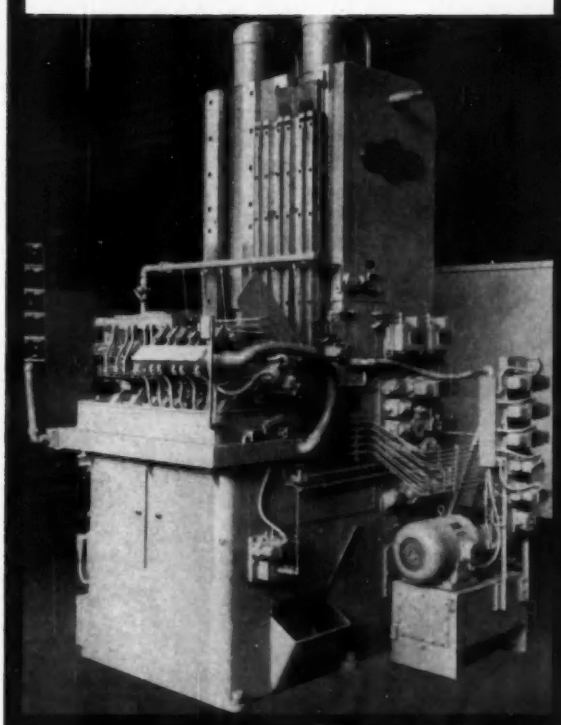
to give you peak broaching performance

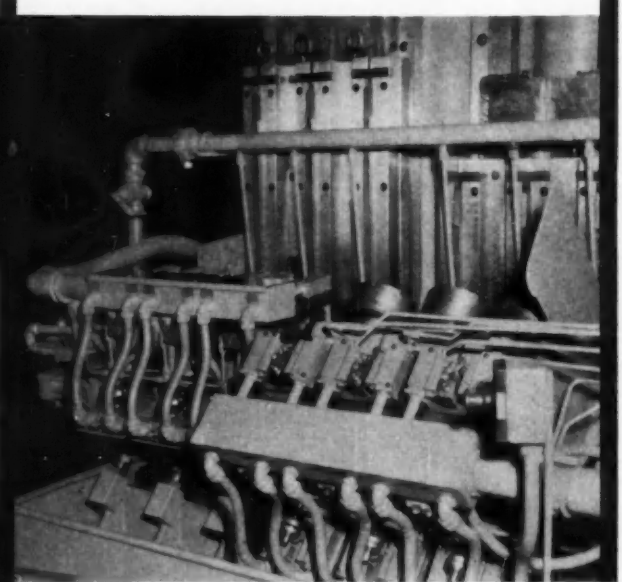
2 SPECIFYING THE RIGHT MACHINE

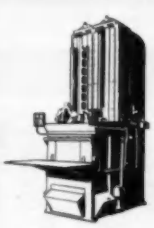
Production rate required, length and speed of stroke, relationship to other production machinery, and available floor space determine the selection of the broaching machine capable of doing the best job. At American, machine selection follows design of the broaching tool. Because American builds a complete line of standard machines and has extensive experience with specials, you can depend on getting the most practical machine for your job.

3 EFFICIENT FIXTURING

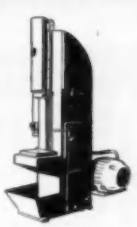
Whatever your part geometry or hourly needs, fixturing by American Broach forms the vital third link in the production chain. Whether manual loading and unloading is used or the work cycle is completely automatic, work-holding fixtures designed and built by American Broach feature easy loading and unloading coupled with positive clamping during the broaching cycle. Even with relatively inexperienced operators, production schedules are maintained since the "skills" are built into the tool, machine, and fixtures.







Duplex Ram



Presses

For more information on practical broaching methods write for Bulletin A214.

SUNDSTRAND

American

BROACH & MACHINE DIVISION

SUNDSTRAND MACHINE TOOL COMPANY

ROCKFORD, ILLINOIS

Before buying any Tracer Turning Equipment

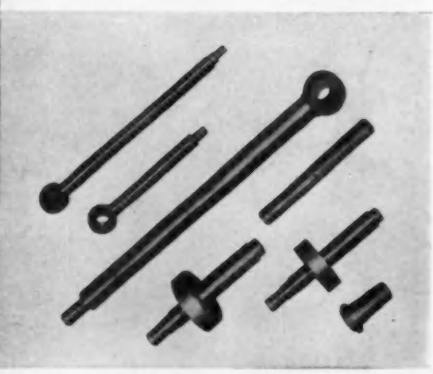
See what you get with **SUNDSTRAND**

"Engineered Production"

FOR EXAMPLE: Production increased 80% on miscellaneous turning jobs!

Here's an example of how one company uses a Sundstrand Tracer Lathe to improve production over previous turning methods. Lot sizes are small, set-up time is short, and production has increased approximately 80%.

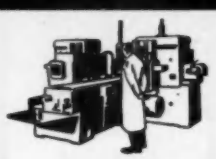
Large or small-lot tracer turning—including the jobs that call for heavy cuts—are being handled with unprecedented efficiency on Sundstrand automatic lathes. Substantial savings and a high degree of flexibility in operations are being realized regularly in metalworking plants of every size using the tracer setups best suited to their operations. Ruff, semi-finish, and



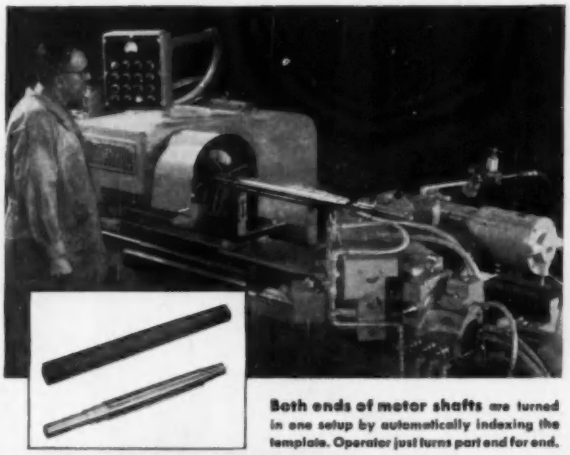
Parts shown above are ruff, semi-finished and finish turned in one automatic multi-cut cycle and with only one template for each part.

SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS



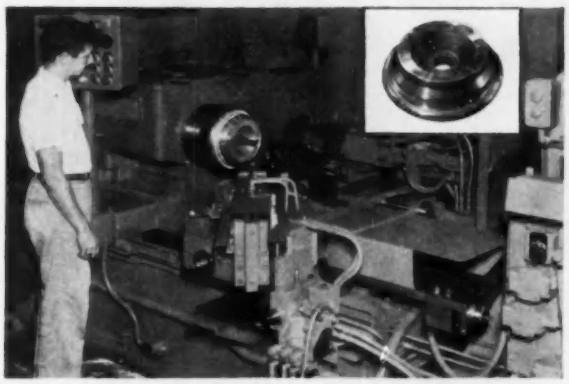
Turning and facing both ends of pinion shafts on a Sundstrand Model 14T Lathe using an indexing tool turret equipped with both ruffing and finishing tool.



Both ends of motor shafts are turned in one setup by automatically indexing the template. Operator just turns part end for end.

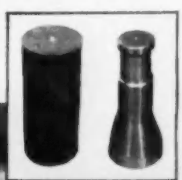
finish cuts can be made in a single automatic cycle using just one template. Lathes can also be provided with ruff and finishing tools in quick indexing turrets or with automatic template indexing where both ends of a part are handled in one machine.

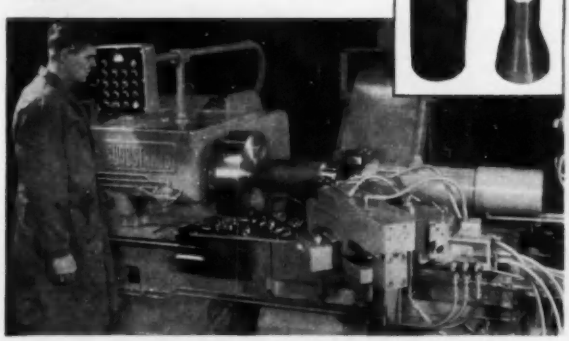
Sundstrand's "Engineered Production" Service assures the selection of the tracer lathe best suited to obtain the most practical turning method for your machining requirements. A complete range of standard, as well as special Multi-Cycle Tracer Lathes are available to fulfill your requirements.



Turning, boring, and knurling the irregular contour of magnesium aircraft wheels.

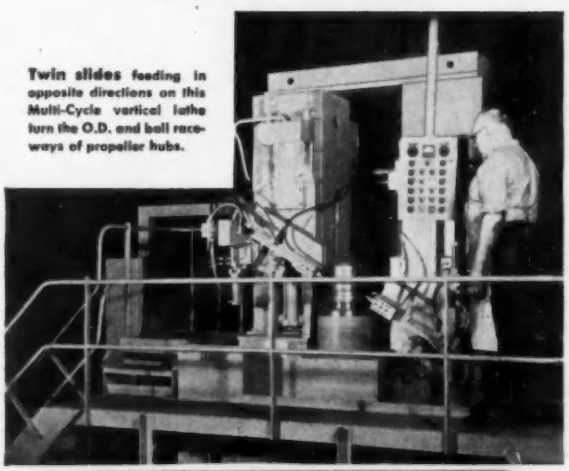
Additional information on Sundstrand Multi-Cycle Tracer Control is available in Bulletin 279. Write for your free copy today.



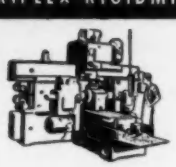


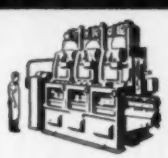
A four cut automatic cycle speeds the heavy stock removal on rock drill parts. Easily adjusted stops control the automatic cycle of this tracer lathe. A hydraulically actuated rear slide grooves the shank end of the part.

Twin slides feeding in opposite directions on this Multi-Cycle vertical lathe turn the O.D. and ball raceways of propeller hubs.



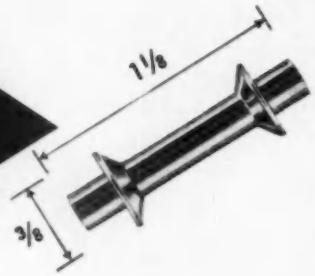
TRIPLEX RIGIDMILS | SPECIAL MACHINES





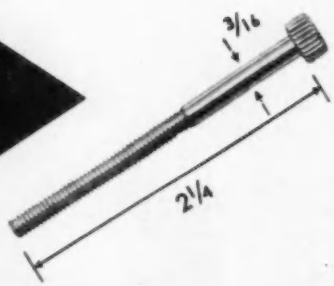
SUNDSTRAND
Machine Tool Co.
2571 Eleventh St. • Rockford, Ill., U.S.A.

SAVINGS
$4.25
PER THOUSAND
over machine method cost



SAVINGS
$12.35
PER THOUSAND
over machine method cost

SAVINGS
$6.80
PER THOUSAND
over machine method cost



COLD-HEADING

SAVES YOU MONEY ON JOB-DESIGNED SMALL PARTS AND FASTENERS

Cold-Heading is the most versatile, most economical method for producing your fasteners and small parts. These case histories are typical of thousands of money saving jobs we've done for our customers. May we quote on your requirements? Write today for the Hassall Catalog.

John Hassall, Inc., P.O. Box 2194, Westbury, Long Island, N.Y.

Hassall

SINCE 1850

NAILS, RIVETS, SCREWS
AND OTHER COLD-HEADED
FASTENERS AND SPECIALTIES

MACHINERY NEWS

(*Continued from page* 156)

to friendly foreign countries. This act has no effect on shipments of goods made in foreign countries of foreign materials. Somehow, this just doesn't seem logical.

Moore Expansion

A major plant expansion planned by Moore Special Tool Co., Inc., for late this year should enable the Bridgeport, Conn., machine tool manufacturer to cut down its heavy backlog of orders for jig borers, jig grinders and other toolroom equipment. Occupation of a 74,600-sq ft, two-story building adjoining the present Moore plant will bring the total plant area to 122,600 sq ft.

Dual Investment

Alloy Precision Castings Co., known for the Mercast Process, has added a lost wax investment division. The company is said to be the only producer of investment castings capable of combining, on a commercial scale, the two methods of precision casting.

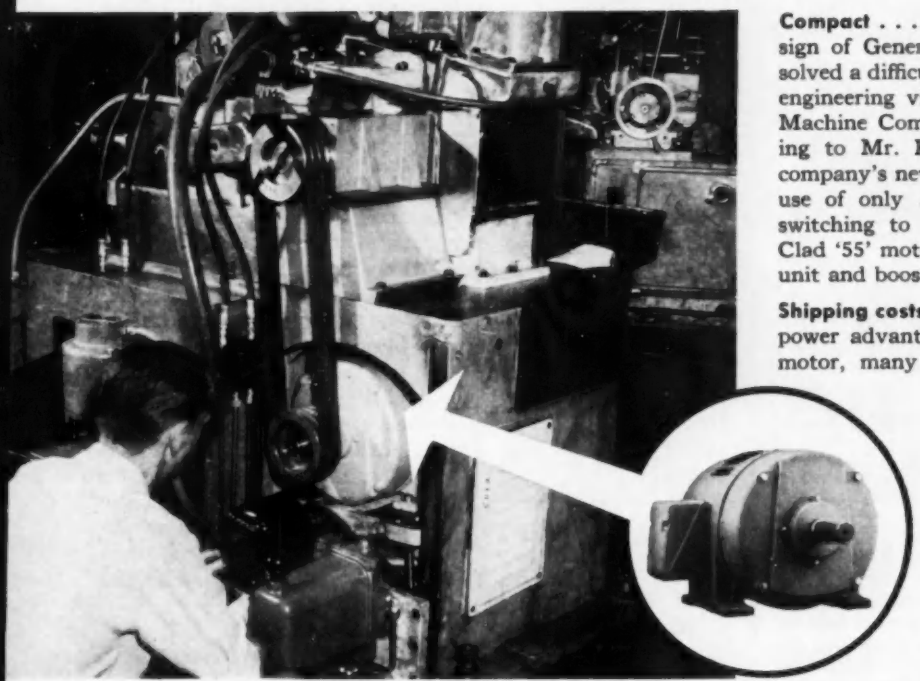
Die Casting Standards

Buyers of die castings can now obtain, for the first time, comprehensive Standards covering the principal provisions specific to die casting purchasing contracts. Just released by the American Die Casting Institute, the new Standards are designated as the "C" Series and constitute a presentation of the prevailing and customary arrangements normally found in the proposal and acknowledgment forms used by the die casting industry. The "C" Series of Product Standards covers commercial terms of orders; shipping tolerances, deliveries and packing; die casting dies and production tooling; price escalation provisions; inserts and gages; patents; warranty; and limitations on inspection.

Press Lubricants

"Choose Your Press Drawing Lubricants With Care" was the subject of a paper delivered by

"We switched to the compact G-E TRI 55 CLAD motor and boosted power by 50%"



Compact . . . power-packed—The compact design of General Electric's Tri-Clad '55' motor solved a difficult power problem for Roger Pyne, engineering vice-president of the Van Norman Machine Company, Springfield, Mass. According to Mr. Pyne, "space limitations on the company's new centerless grinder permitted the use of only a 5-hp conventional motor. By switching to the smaller, more compact Tri-Clad '55' motor we were able to go to a 7½-hp unit and boost our grinder's capacity by 50%."

Shipping costs reduced 40%—In addition to the power advantages of the smaller Tri-Clad '55' motor, many companies are finding that the lighter, easier-to-handle motor has cut shipping and handling costs as much as 40%. Contact your nearest General Electric Apparatus Sales Office to learn the many years-ahead benefits that the new Tri-Clad '55' motor can bring to your product . . . to your operation.

FREE SLIDE RULE

ADVANCE INFORMATION TO HELP YOU PLAN AHEAD

WRITE FOR FREE SLIDE RULE which lets you determine at a glance the weight and space benefits of recently announced NEMA standards for larger motors. This handy slide rule provides advance information to solve your design problems . . . to benefit your overall operation.

SECTION E891-1
GENERAL ELECTRIC COMPANY
SCHENECTADY 5, NEW YORK

I want advance information on new NEMA dimensions for larger motors. Please send me free slide rule.

NAME _____

COMPANY _____

ADDRESS _____

CITY & STATE _____

TITLE _____

Progress Is Our Most Important Product

GENERAL ELECTRIC

a NEW protective coating
for the
NEW high tensile steels
Zincilate
410
Zincilate 410 meets all requirements of Spec. MIL-P-26915 (USAF)
PREVENTS HYDROGEN EMBRITTLEMENT
REQUIRES NO COSTLY PLATING EQUIPMENT
NO LIMITATION IN SIZE OR SHAPE OF PARTS TO BE COATED

The tremendous speeds being achieved by modern aircraft have created a whole new set of design engineering problems. New steel alloys, heat treated to secure higher tensile strengths, had to be developed to withstand the heat generated by extremely high speeds, and to resist the shock of high speed landings.

These completely new high tensile steels require a completely new type of protective coating. Being subject to even greater hydrogen embrittlement than ordinary steels when cadmium plated, these new alloys require Zincilate 410, a protective coating that eliminates all traces of hydrogen embrittlement.

Zincilate 410 (one of several Zincilate formulations) provides other outstanding advantages over outmoded protection methods. Zincilate 410 will increase productive output because the controlled time cycle and size limitations of plating are eliminated. Conventional painting equipment is used to spray, dip or brush Zincilate 410, thus no more costly plating equipment. Zincilate 410 can be applied in the field, without dismantling the damaged part for return to the plating plant. And you can apply Zincilate 410 in your own plant, saving more time and money.

If your product is now being cadmium plated, all these advantages can be yours by simply using Zincilate 410. You may be surprised by the first cost, but you'll be amazed by the savings, which are far greater. Why not outline your coating problem now, on your company letterhead please, so we can tell you frankly what Zincilate 410 can do for you?

Zincilate

CORROSION-RESISTANT, ABRASION-RESISTANT, WELDABLE, AIR-DRIED and BAKED PROTECTIVE COATINGS

INDUSTRIAL METAL PROTECTIVES, INC., 403 HOMESTEAD AVE., DAYTON 8, OHIO

Leon Salz before the American Society of Lubrication Engineers at its annual meeting in Detroit last month. Mr. Salz, manager, Lubricants Div., Magnus Chemical Co., Inc., Garwood, N. J., said, "Press forming lubricants are frequently known to their users only by trade designations. The cloak of mystery surrounding this subject has resulted in the trial and error procedure being employed for the adoption of a product more often then can be justified in the light of technical information available. Actually, there are five principal classes of materials found in stamping and drawing lubricants. These are: oilness agents, EP agents, emulsifiers, diluents and inhibitors. From these categories the manufacturer selects appropriate components and blends them into a product that will do the required job. The individual component raw materials are carefully selected so that the finished product will provide the user with highest service efficiency with respect to die life and minimum rejects, ease of application and removal, non-corrosiveness, appeal to operators and overall economy."

Big Tank

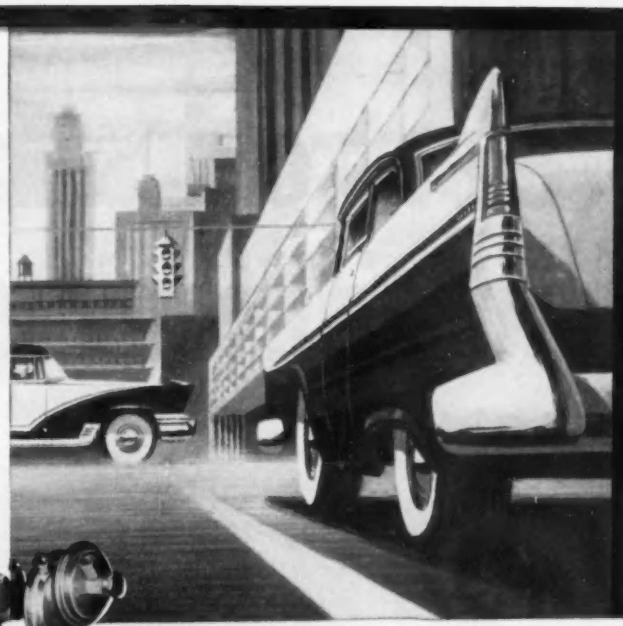
The Metal Finishing Div., Frederic B. Stevens, Inc., Detroit, reports that shipment was recently completed on what may be the largest processing tank for the anodizing of aluminum ever produced. The tank measured 26 ft long, five ft wide and 14 ft deep and required seven heavy gage steel reinforcing belts to insure rigidity when filled with solution. In addition, the entire inner area (about 1000 sq ft) was coated with a 3/16 in. Koroseal lining. Delivery of the complete tank was made to Reynolds Metals Co.

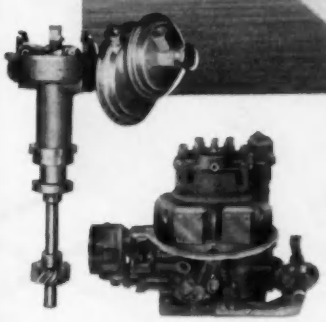
U S. Steel Corp. has initiated a new employe suggestion plan with a top award of $10,000. The company has also issued a new catalog of its motion pictures.

* * *

Technical Career Council, 19 S. LaSalle St., Chicago 3, Ill., will sponsor a technical career conference in Chicago for five days starting June 8.

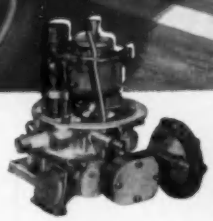
to solve your design problems . . . to benefit your overall operation.





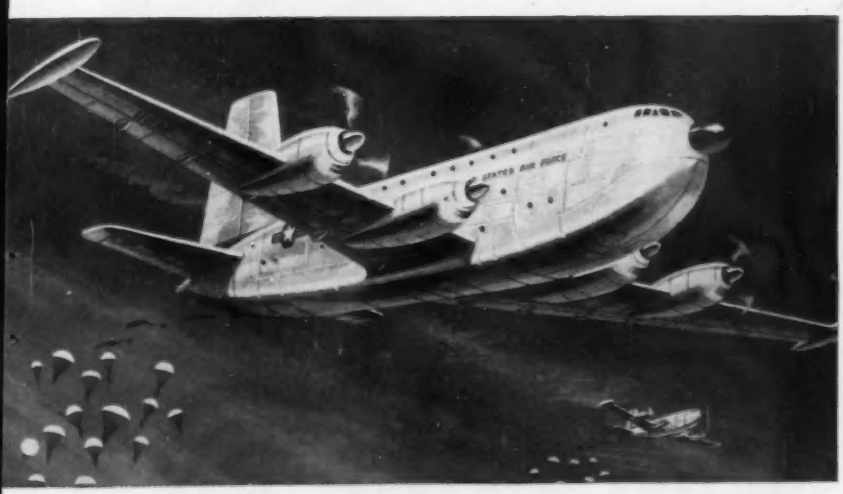
IN AUTOMOBILES—over 10 million of them—you'll find Holley carburetors and distributors. Holley's outstanding record of "firsts" in this field includes the 4-barrel carburetor with vacuum controlled secondary barrels.

IN TRUCKS. More of America's truck engines are Holley carburetor equipped today than are equipped with any other carburetor. Leading truck manufacturers combine Holley's carburetor, distributor and governor for an integrally-designed control system which provides maximum power and maximum economy features.



Engine Control Systems by Holley

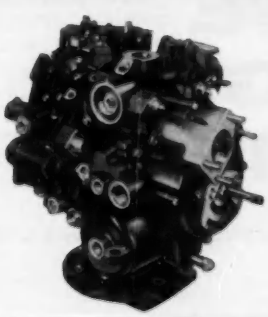
"Mechanical Brains" to Control the Power of the Engines of America



Effective control of engine power is not a simple process of fuel metering—rather it is a problem of co-ordinating the many variables in such a way that the pilot's or driver's demand is instantly satisfied in the optimum manner.

For over half a century, Holley has supplied control systems to harness the power of automobile, truck and aviation engines of all types. Holley carburetors and distributors for automobiles and trucks, and turbine controls for jet aircraft provide maximum efficiency and minimum operating costs for today's engines.

Wherever control systems are needed — for auxiliary or main power plants — Holley's half a century of design, engineering and manufacturing experience can best meet your requirements.



IN AIRCRAFT—jet fighters, bombers, and huge airliners of the future—power control systems by Holley automatically make engine adjustments for busy pilots.

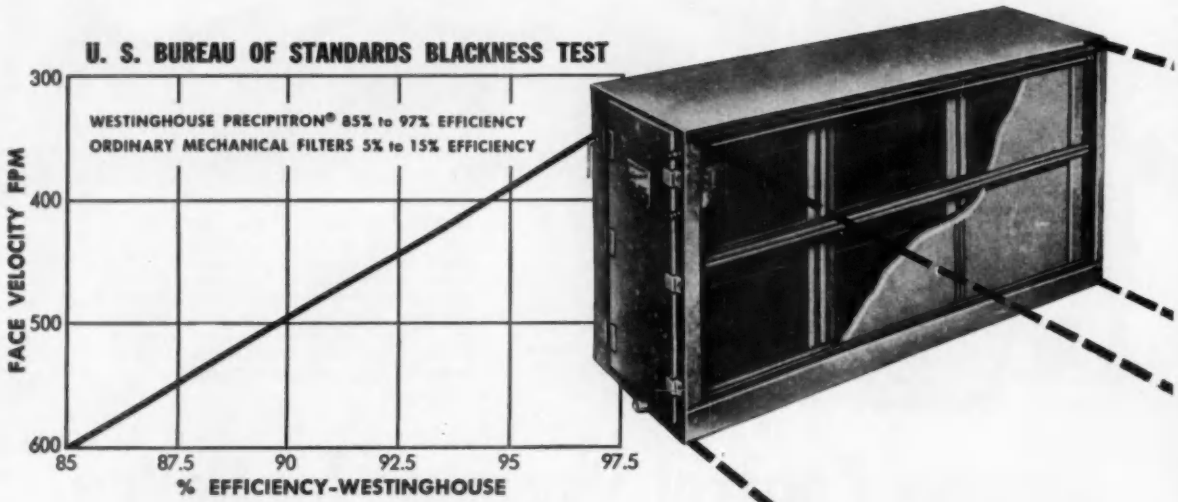
HOLLEY Carburetor Co.

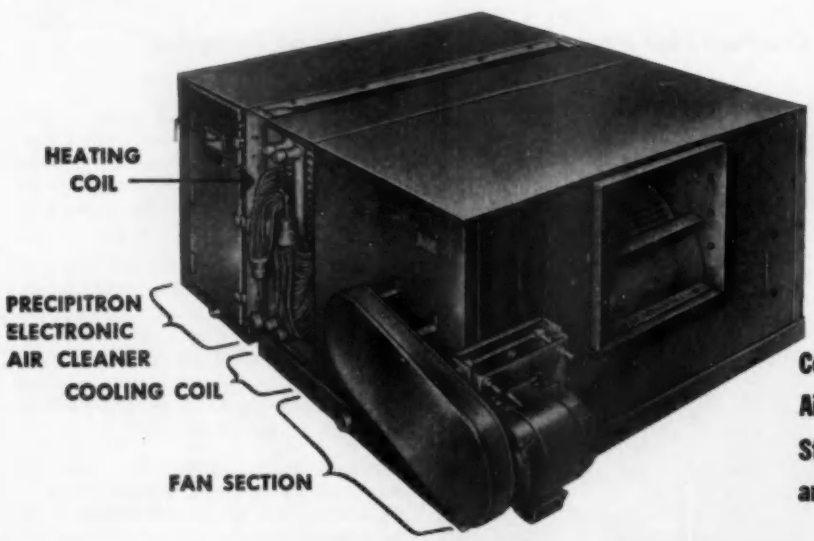
FOR MORE THAN HALF A CENTURY —ORIGINAL EQUIPMENT MANUFACTURERS FOR THE AUTOMOTIVE INDUSTRY.

11955 E. Nine Mile Road, Van Dyke, Michigan

1-24

NEW "In-Line" electronic air unit air conditioning

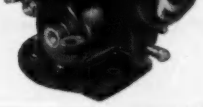




Compact "In-Line" Westinghouse Air Distributing Unit Available In: Standard Sprayed Coil Multi-Zone and Heating & Ventilating Types

J-80623

WESTINGHOUSE AIR HANDLING AND AIR CLEANING



I-24

Carburetor Co.

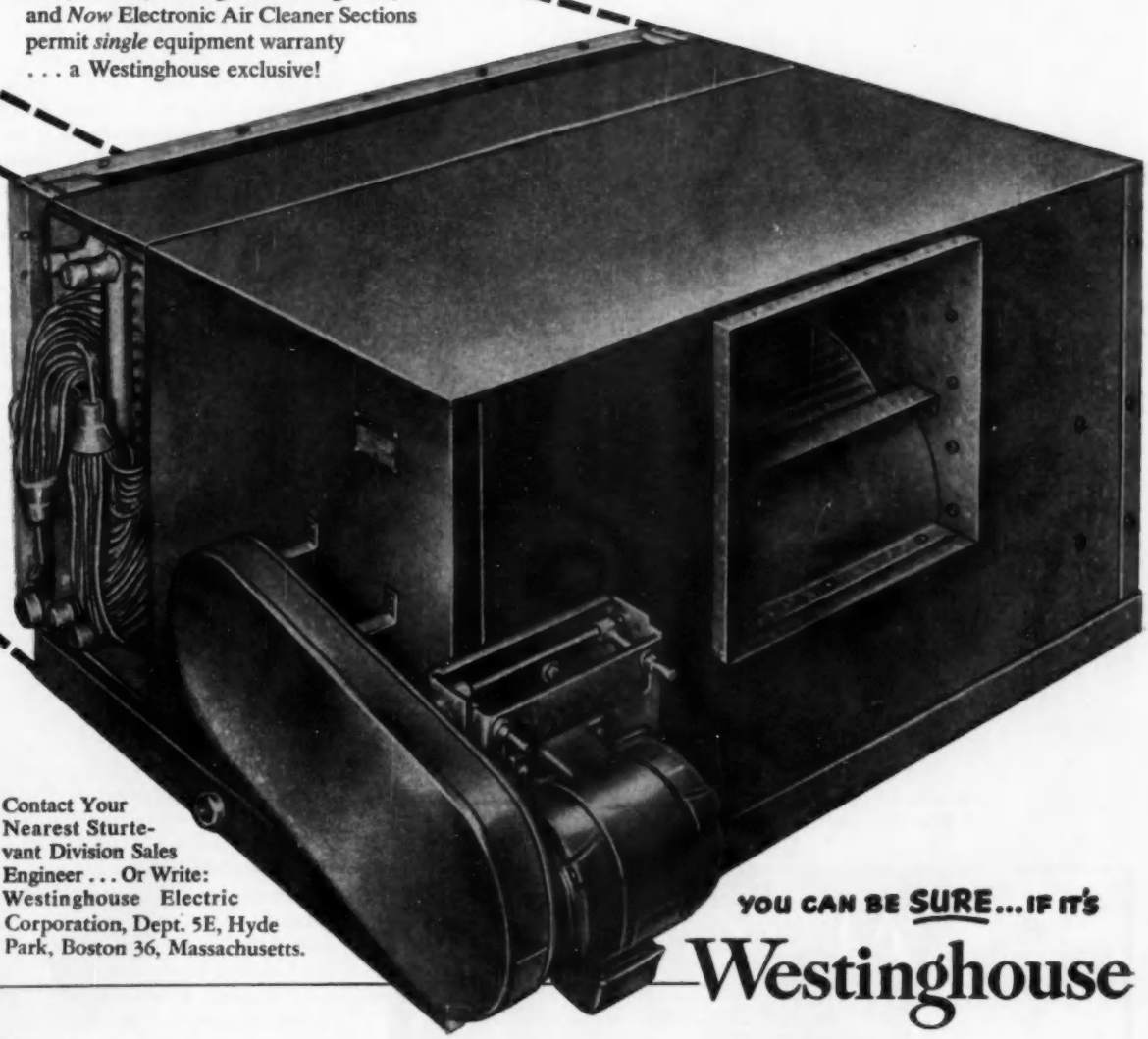
11955 E. Nine Mile Road, Van Dyke, Michigan

cleaner section for your and ventilating systems

A NEW DEVELOPMENT—A WESTINGHOUSE FIRST...

Top Cleaning Efficiency at Normal Coil Face Velocities. Less Costly to Install and Operate

Westinghouse manufactured fans, motors, heating and cooling coils, and *Now* Electronic Air Cleaner Sections permit *single* equipment warranty . . . a Westinghouse exclusive!



Contact Your Nearest Sturtevant Division Sales Engineer . . . Or Write: Westinghouse Electric Corporation, Dept. 5E, Hyde Park, Boston 36, Massachusetts.

YOU CAN BE SURE... IF IT'S

Westinghouse

Precision?
Dependability?
it's AUTOMATIC!

STRESS RELIEVING
at Automatic puts "ZING" in your springs

No matter how accurately a coiled spring meets specifications, it will not stand up in actual use unless the internal stress of the metal (caused by coiling) is properly relieved by a prolonged low temperature heat-treating process.
Automatic's stress relieving know-how determines the *best possible* length and degree of "cooking heat," thus guaranteeing the user the optimum in lasting resiliency and load-carrying capacity.

Send for new illustrated brochure giving information for the specifying of springs and other data.

for quality springs "Automatically" think of
AUTOMATIC
SPRING COILING CO.
4048 West Thorndale Ave., Chicago 30, Ill.

MACHINE TOOL ELECTRIFICATION FORUM

(*Continued from page* 63)

mental, indications are that the transistor has characteristics which may prove attractive for incorporation into control applications, especially when the logic block is designed around it.

● Automatic Grinder

The development of a four-headed automatic cycling grinder, incorporating Cypak static control, was covered by R. C. Montanus, The Springfield Machine Tool Co., and E. B. Ankenman, Westinghouse Electric Corp. Design of the new machine and controls includes provision for considerable versatility of operation. Each head is capable of two grinding cycles: one, a standard operation with wheel dress at finish; and the second, a preliminary grind cycle with dress, and then finish grind. The design recognizes that any combination of heads might be in use with either of the head cycles in any combination. This provision is preset on an integral setup station. The upper heads can also be called upon to operate in sequence, since faces to be ground may necessitate head positioning that would cause mechanical interference. In addition, an automatic loading station is tied into the machine cycle.

● Time-Sequence Recorder

Designed to supersede the now inadequate "eyeball" and "stop watch" methods of timing automated machinery, an instrument has been developed as a specific means for timing accurately and recording graphically the operational events making up a repetitive machine cycle. How it functions and how it is being applied were described by Kirk E. Birrell, The Sheffield Corp.

The device, called the Monitorecord, makes recordings on pressure-sensitive paper by electrically-actuated stylii. Receptacle-connected to electrical terminals on the machine to be monitored which give element start-and-stop times when energized or de-energized, it provides a bar-chart picture of the

VS-100

new all-electric machine tool feed drive

No pick-off gears or gear changes are necessary with the VS-100. Infinitely variable 100 to 1 speed range offers high speeds for rapid traverse as well as the slowest feed rates.

Feeds may be precisely selected and rapidly changed, even during a cut. The push button operator's station provides easy, instantaneous feed control. This remote station contains controls for start, stop, jog, reverse, and speed changing . . . ideal in pendent station mounting for maximum operator's convenience. Additional functions, such as automatic dwell and automatic feed programming are available for the operator's station.

The VS-100 operates from 220 or 440 volt, single phase, a-c. circuits. Seven sizes are available ranging from ½ thru 4 horsepower. For complete details write for bulletin D-2501. D-1540

RELIANCE R ELECTRIC

AND ENGINEERING COMPANY

DEPT. 55A, CLEVELAND 17, OHIO • CANADIAN DIVISION: WELLAND, ONTARIO

Sales Offices and Distributors in Principal Cities

relationships of simultaneous and/or sequential operational events. A portable unit weighing but 15 lb, the instrument is a 14-channel recorder. It is usable for "debugging" new equipment; and by taking routine time-data charts and comparing them with a master coded chart, operational efficiency can be checked from time to time for possible out-of-adjustments. A related application is for measuring the quantitative performance of a production line.

● Obsolescence

The high cost of obsolescence and down-time associated with modern high-production machine tools under prevailing conditions of product changes in the automobile industry, was discussed by J. F. Randall, Ford Motor Co. He gave estimates which placed the total industry cost of obsolescence during the past three years at about $320 million. Of this amount the cost of facilities actually retired amounted to about $80 million. Product design changes required an expenditure estimated to be $240 million additional to rework existing facilities and purchase new machines.

Much of this cost was attributed to the relatively inflexible characteristics of many of the present high-production machine tools. While stating that the "building block" principle had been applied to some in-line transfer machines, he advocated still further planning for reduced future obsolescence. In addition to current provisions of interchangeable machine components, he suggested an extension of the idea to other types of machines, the use of unitized hydraulic and pneumatic systems, and the utilization of unitized electrical plug-in controls.

● "Thinking" Controls

Controls which "think" for themselves and automatically adjust process factors for optimum results, are in prospect according to a report given by Albert J. Kerstukos, Westinghouse Electric Corp. This new concept is termed "teleological control," based on the definition of teleology as being the fact or character of being directed towards an end or shaped by a purpose. It is unlike conventional controls which force the controlled process to conform to predetermined instructions. A teleological control is allowed to experiment with the process until it finds the goal as determined by a set of built-in rules.

Automex (taken from the words "*auto*matic *ex*perimenter") is the Westinghouse trademark for such a teleological control device which operates by intelligent trial and error. Its purpose is to control a system where optimum output can be achieved by properly adjusting each of several input variables, even when the best adjustment for any one input changes with time—all without human guidance.

● Press Lines

Five methods for synchronizing high-speed automated press lines were set forth in a paper given by Gordon M. Sommer, Clearing Machine Corp. Briefly, the systems utilize basic concepts as follows:

(1) In one system the feeds are

ROCKFORD

MULTIPLE CLUTCH SPRINGS

Small Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

ASSURE EVEN PRESSURE

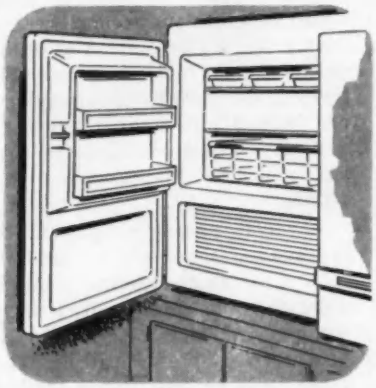
As many as 24 best quality springs are used in ROCKFORD Spring-Loaded CLUTCHES—to assure even pressure all around the plate. Made of heat-resistant wire (that will not take a "set") the springs provide long service life in today's high-speed engine driven vehicles.

BW SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

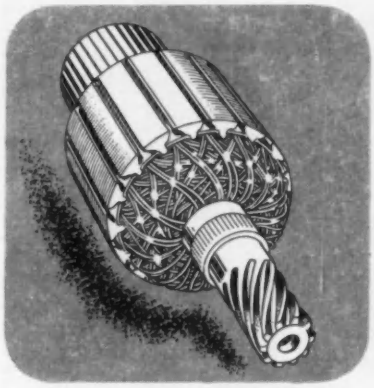
ROCKFORD Clutch Division BORG-WARNER
315 Catherine St., Rockford, Ill., U.S.A.
Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

You can save time and money with R/M *Ray-BOND*® Adhesives

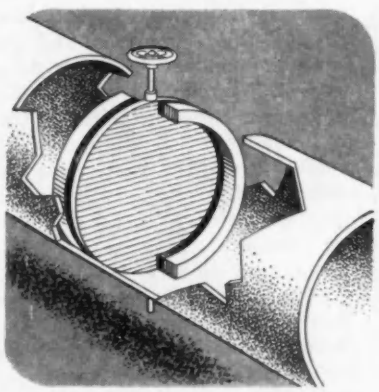


Bonding laminated panels of all-plastic refrigerators



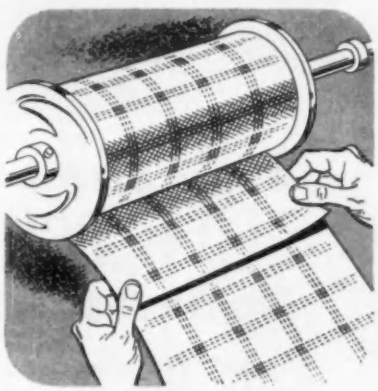
Bonding, sealing, protecting armature coils

Bonding friction materials to metal



Bonding rubber seals to valve gates

Bonding sealing strip to car door



Bonding textile to textile

FOR THESE AND COUNTLESS OTHER APPLICATIONS NEW R/M RAY-BOND ADHESIVES CAN BE TAILORED TO YOUR NEEDS

Modern bonding techniques can simplify and improve product designs and eliminate troublesome production fastening operations. Shown above are a few applications which may suggest where R/M Ray-BOND adhesives, protective coatings, and sealers can have important advantages for you—*whether or not* bonding, laminating, sealing or coating are now factors in your operations.

From more than 20 years of experience in the production of bonded assemblies, R/M has acquired a wealth of experience in developing adhesive products to save time and money in varied applications. Call on our engineers to work with yours in finding new ways to cut costs and simplify production. Adhesives Department, RAYBESTOS-MANHATTAN, Inc., Bridgeport, Conn.

R/M Bulletin No. 650A contains engineering information you will want on Ray-BOND adhesives, protective coatings and sealers. Write for your free copy.

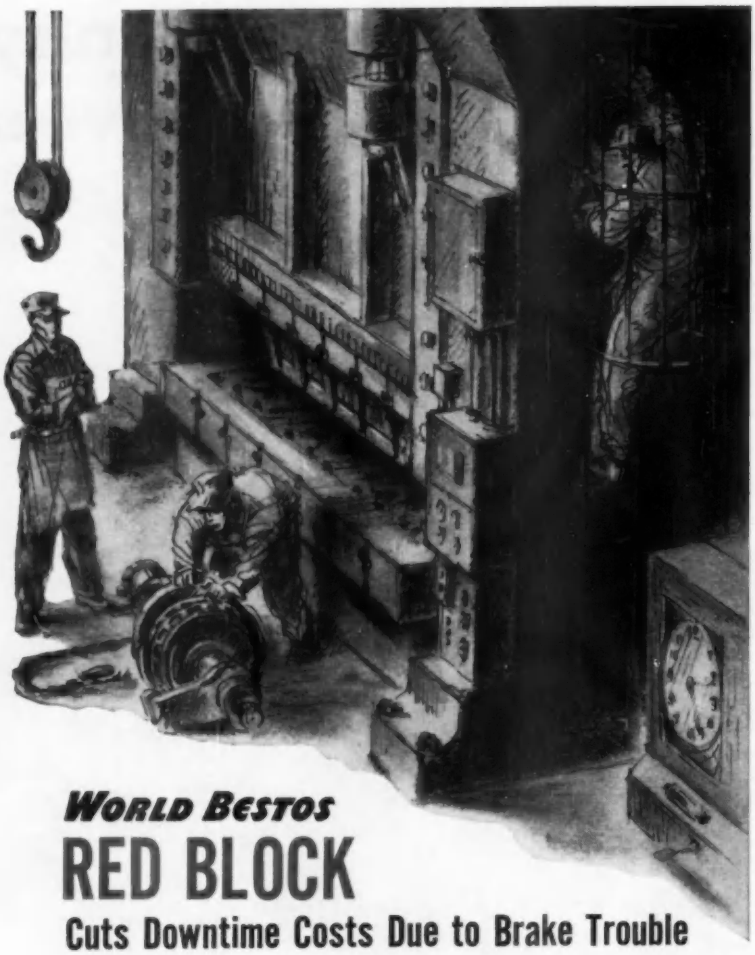
RAYBESTOS-MANHATTAN, INC.

ADHESIVES DEPARTMENT: Bridgeport, Conn.

Chicago 31 • Detroit 2 • Cleveland 16 • Los Angeles 58

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; Passaic, N.J.; No. Charleston, S.C.; Crawfordsville, Ind.; Neenah, Wis.; Raybestos-Manhattan (Canada) Limited, Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Industrial Adhesives • Brake Linings • Brake Blocks • Clutch Facings • Industrial Rubber • Engineered Plastics • Sintered Metal Products Rubber Covered Equipment • Asbestos Textiles • Laundry Pads and Covers • Packings • Abrasive and Diamond Wheels • Bowling Balls



WORLD BESTOS

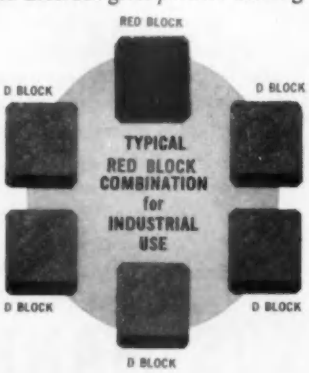
RED BLOCK

Cuts Downtime Costs Due to Brake Trouble

Up to *600%* longer wear . . . major reduction in downtime costs . . . that's the amazing story of RED BLOCK performance on brakes and clutches—wherever it's in use!

World Bestos RED BLOCK brake sets *can't* fade . . . they're the *only* linings that supply *guaranteed no-fade performance even under stepped-up operating conditions.* RED BLOCK gives *positive* braking power at highest operating temperatures . . . let's you "pinpoint" stops where you want them, when you want them.

Try RED BLOCK next time you're "braking up" . . . ask for it when you buy new equipment. You'll soon see how much less the best really costs.



● Write for full information and illustrated folder on RED BLOCK Combinations for industrial uses.

WORLD BESTOS NEWCASTLE, INDIANA

DIVISION OF THE
Firestone
TIRE & RUBBER COMPANY

Brake Blocks and Linings • Clutch Facings • Transmission Linings • Spring Liners and Buttons • Special Friction Materials

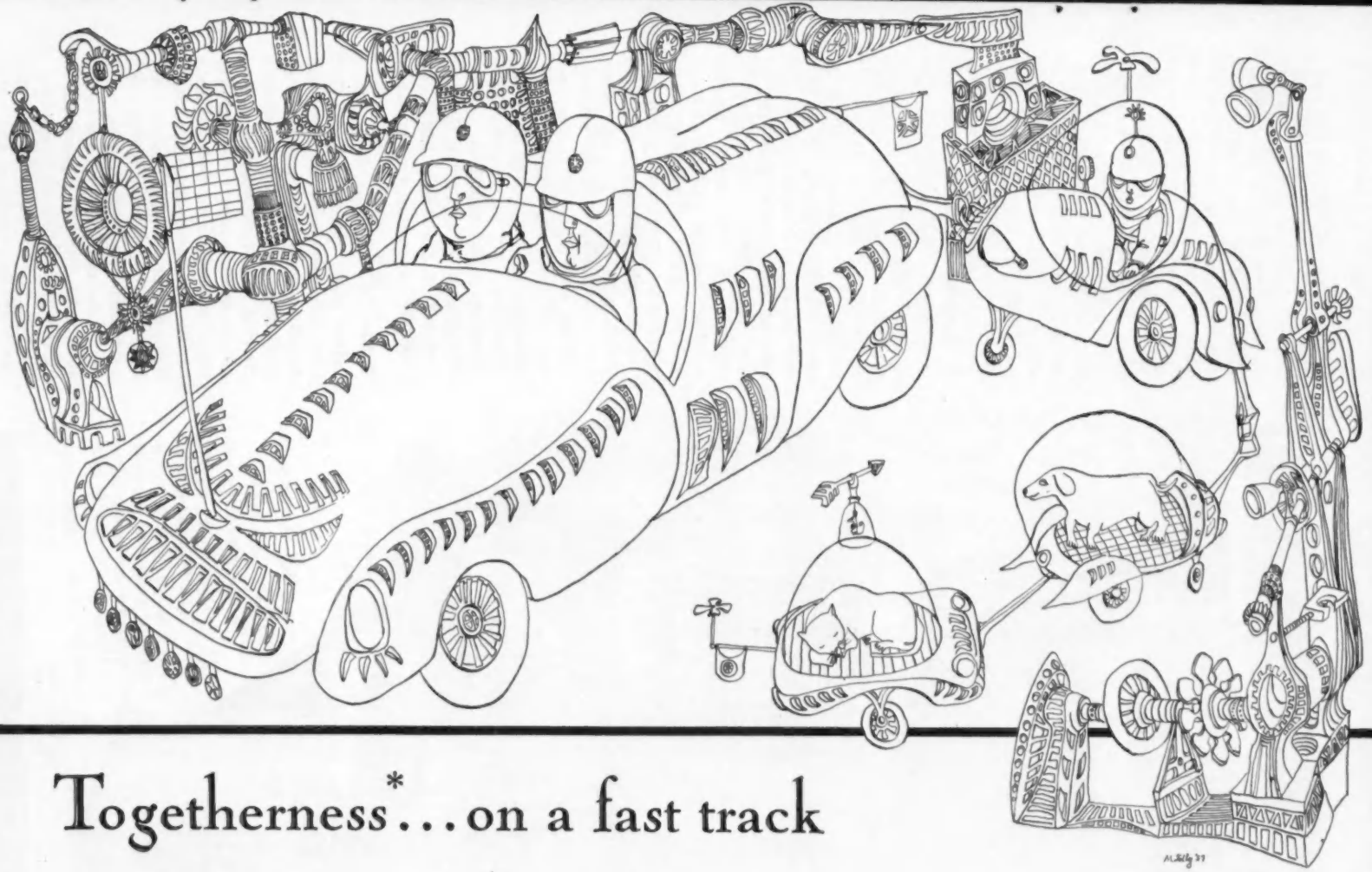
mechanically-connected through the press line to operate as an integral unit and to integrate the operation. Presses are single-stroked. Sequencing of feed is controlled by position limit switches, and the presses complete a cycle while the feeds are advancing. Initiated for the production of automobile wheels, output of the system was designed for 12 stampings per minute. It was stated that with a few modifications, the output could be 18 stampings per minute.

(2) The second method is to synchronize the feeds by position control, in which the first press is a double-action press or draw press whose cyclic rate determines the production of the entire line. The other presses are single-stroked slave presses with a cyclic rate of at least 20 per cent above that of the "master" press. Feeders are independent of the presses and are driven individually by d-c motors operating through a clutch and brake unit. Speed matching of the feed motors to the reference tachometer generator is obtained by matching the voltage impressed upon the motor, in each case, with the voltage of the reference tachometer through an electronic high-gain regulator. In addition, synchro units are driven from the master press and the feeders, acting as a vernier to the speed signal to insure exact synchronization of the feeder drives with the master press.

(3) The third method is one in which the feeds are mechanically driven by each press. At present two methods of synchronization are known and a third is under development. The first of these is essentially of the same d-c motor type just mentioned. A second uses eddy-current clutches for synchronizing; speed and position feedback control being applied to vary the density of current drawn by the various clutches. The third, under study, would use an a-c motor for driving the flywheel as the major power source, and a much smaller variable-speed power source differentially-geared to the drive shaft of the press for speed and position control.

(4) The fourth method involves synchronizing presses and feeds as

USS STAINLESS STEEL



Togetherness*... on a fast track

The drawing is strictly for enjoyment, designed to tickle your fancy. We think it does a nice job of poking gentle fun at the exurbanite sports car set—homo americanus crampiensus.

What we *really* want to talk about is the Stainless Steel you see on *all* cars. No other metal resists denting and corrosion so well. No other metal can keep its luster for so long. And Stainless trim is often cheaper to fabricate than plated parts.

You'll enjoy buying Stainless from United States Steel because we think the customer is always right, and we've got a whopping variety of Stainless Steel grades, types and finishes. If you'd like a reproduction of the above drawing for framing, write to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

Drawing by Marie Tuccillo Kelly. Reproductions available on request.

**With bouquets to McCall's*

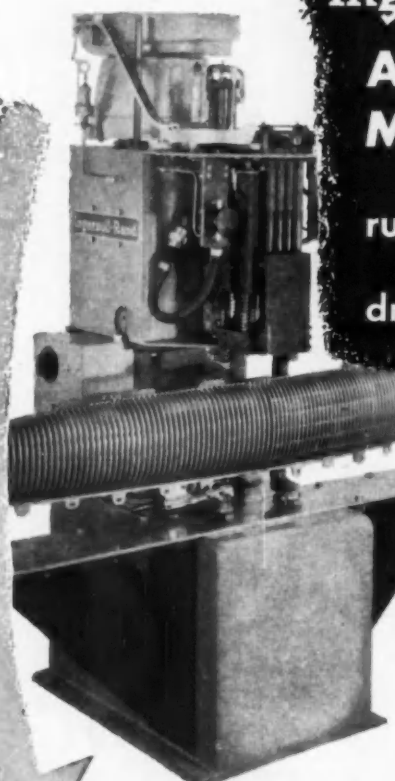
put the f-a-s-t in fastening

... and improve quality, too ...

with **Ingersoll-Rand**

ASSEMBLY MACHINES

for running nuts and driving screws!



- first in experience
- first in quality
- first in service

Any bolt size ... any number of spindles ... maintains desired torque manual or completely automatic operation. Write for an Ingersoll-Rand AIRengineer to survey your needs.

Automatic assembly machine feeds and drives four self tapping screws in three seconds.

8-522

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

a combination of methods two and three, with feeds synchronized both by position control and by individual drive from each press. This method is said to offer continuous operation, along with flexibility of application.

(5) The fifth method is one in which the feed is by mechanical drive from the presses, without any synchronizing drive or a flexible transfer link. In this system the master or lead press is operated continuously, and the following presses are single-stroked and have a faster cyclic rate.

● Equipment Standards

Industry is in urgent need of standards for industrial electronic equipment, R. B. Colten, General Motors Corp., told the gathering. He stressed it should be understood that in speaking of standards he was concerned with standards of quality, and standardization of nomenclature, drawing symbols, etc. Specifically, useful standards could be written on items such as: ratings and specifications; components; physical construction; wiring, soldering and other connections; instructions and diagrams, including symbols, nomenclature, and parts lists; ventilation; and operating characteristics, including frequency and ease of calibration and adjustment. The objectives would include the establishment of a minimum quality level and a reasonable degree of uniformity.

● New D-C Motors

The new Westinghouse Life-Line H series of d-c motors (see AI, May 1, page 87) was shown publicly for the first time at the meeting. Their design and application features were detailed in papers given by F. E. Spindler and L. W. Herchenroeder, Westinghouse Electric Corp. Designed to meet the latest requirements of automation equipment, the machines feature improved performance, reliability and dependability by the use of silicone treated insulation, a new ventilation system, faster dynamic response, and more efficient commutating ability.

● Machine Purchases

The push for higher standards of living, emphasis in industry on

cost reduction to meet mounting wages and taxes, and the need for increased productivity per man will have as an end result the continuing purchase of production equipment in large volume. This prediction was made by Jerome A. Raterman, president, National Machine Tool Builders' Association and president, Monarch Machine Tool Co., one of the featured speakers at the forum. He cited the results of a study which showed that in 1975 there will be an increase of 82 per cent in gross national product, accompanied by an increase of only 35.5 per cent in the available labor force. "This means that productivity per man must be very substantially stepped up—and that can't be done on the equipment of yesterday," he said. "I am convinced," Mr. Raterman added, "that the buying of productive equipment will continue at a high level. There may be periodic dips, but the long-term trend will be upward."

Fawick-Girling Brake System

(*Continued from page* 61)

and high load areas that contribute to heat checking.

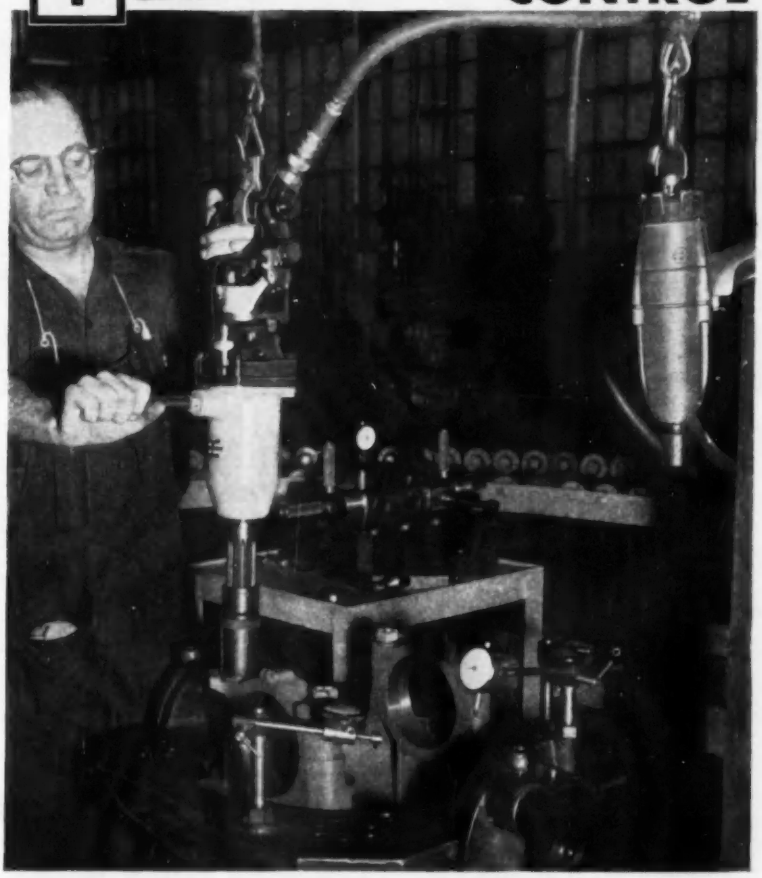
Adjustment has been simplified through the use of a single point adjustment mechanism. It returns actuation to minimum travel and permits full lining wear.

Finally, it may be noted that interchangeability of shoes on a standard foundation permits production line variations to suit axle ratings or customer requirements; and simplifies conversions in the field to meet the special needs of geographical locations, terrain, and operating conditions.

Figure 5 shows the Fawick (Neate) hand brake control that is available whenever the rear brakes are specified for parking or emergency use.

Readers of
AUTOMOTIVE INDUSTRIES
are always well informed

I-R TORSION BAR TORQUE CONTROL



TORQUE CONTROL IMPACTOOLS
consistently run nuts to prescribed torques

I-R Torsion-Bar Impactools now assure top quality control on these 3 operations:

1. *Assembling differential main bearing caps at 450 ft. lbs.* both before and after machining as shown above.
2. *Preloading differential drive pinion bearing* with Impactools set at 375 ft. lbs.
3. *Assembling wheels to wheel hubs at* 425 ft. lbs.

Quality control has risen to a new high for this large manufacturer of farm equipment since I-R Torsion-Bar Torque Control Impactools were installed.

These Impactools are the *only* power wrenches that deliver full power and speed until the preset torque is reached, and then instantly and automatically shut off.

Now, with Torque Control Impactools, the company consistently runs nuts to prescribed torques, saves time, improves quality and eliminates hand torque checking operations.

Write for Bulletin 5170 for proof of how these amazing Impactools can improve quality and cut costs on your own applications.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.

8-524

In less time than you took to look at these two photos, 12 hex head bolts can be run down snugly and another pump unit assembled. This is modern fastening, using NEW multiple-unit power tools and NEW Apex Fast-Lead Sockets, specifically designed for split-second assembly.

THIS IS AN APEX FAST-LEAD SOCKET

with specially designed broched opening that provides complete engagement of socket and bolt or nut almost instantly upon contact. All Apex Fast-Lead and Surface-Drive sockets are listed in our new Catalog 129; write, on your company letterhead please, for your copy.

APEX THE APEX MACHINE & TOOL COMPANY
1043 E. Patterson Blvd. • Dayton 2, Ohio

ATLANTA • BALTIMORE • BATON ROUGE • BIRMINGHAM • BUFFALO • CHARLESTON
CHICAGO • CLEVELAND • COLUMBUS (Miss.) • DALLAS • DAVENPORT • DENVER
DETROIT • HOUSTON • INDIANAPOLIS • KANSAS CITY • LOS ANGELES • LOUISVILLE
MEMPHIS • MILWAUKEE • MINNEAPOLIS • NEW ORLEANS • NEW YORK CITY • OAKLAND
PHILADELPHIA • PITTSBURGH • PROVIDENCE • RICHMOND • ST. LOUIS • SEATTLE
SHREVEPORT • SOUTH BEND • SYRACUSE • WICHITA

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to March 20, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the April 15 issue, page 104, of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Office of Defense Mobilization, covering March 21 to April 17, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

AEROJET-GENERAL CORP., Sacramento Co., Calif.
Research and development—$945,000 (60)

AIR PRODUCTS, INC., Trexlertown, Pa.
Research and development—$1,775,325 (45)

BEECH AIRCRAFT CORP., Wichita, Kans.
Military aircraft—$201,225 (70)

BENDIX AVIATION CORP., Pioneer-Central Div., Davenport, Iowa
Military aircraft parts—$240,685 (65)

BOEING AIRPLANE CO., Wichita, Kans.
Military aircraft—$205,727 (65)

BOEING AIRPLANE CO., Seattle, Wash.
Military aircraft—$2,693,221 (65)

FAIRCHILD ENGINE & AIRPLANE CORP., Deer Park, L. I., New York
Jet engines for military aircraft—$803,575 (60)

FAIRCHILD ENGINE & AIRPLANE CORP., Stratos Div., Bay Shore, L. I., New York
Military aircraft parts—$574,000 (60)

GENERAL ELECTRIC CO., Fitchburg, Mass.
Turbine generators for military use—$2,120,085 (50)

GENERAL ELECTRIC CO., Lynn, Mass.
Research and development—$1,230,322 (55)

GOODYEAR AIRCRAFT CORP., Litchfield Park, Ariz.
Military aircraft parts—$47,710 (65)

GOODYEAR AIRCRAFT CORP., Akron, Ohio
Military aircraft parts—$226,447 (65)

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
Military aircraft—$374,038 (65)

LORD MANUFACTURING CO., Erie, Pa.
Military aircraft engine parts—$70,896 (65)

GLENN L. MARTIN CO., Denver, Colo.
Guided missiles—$108,296 (65)

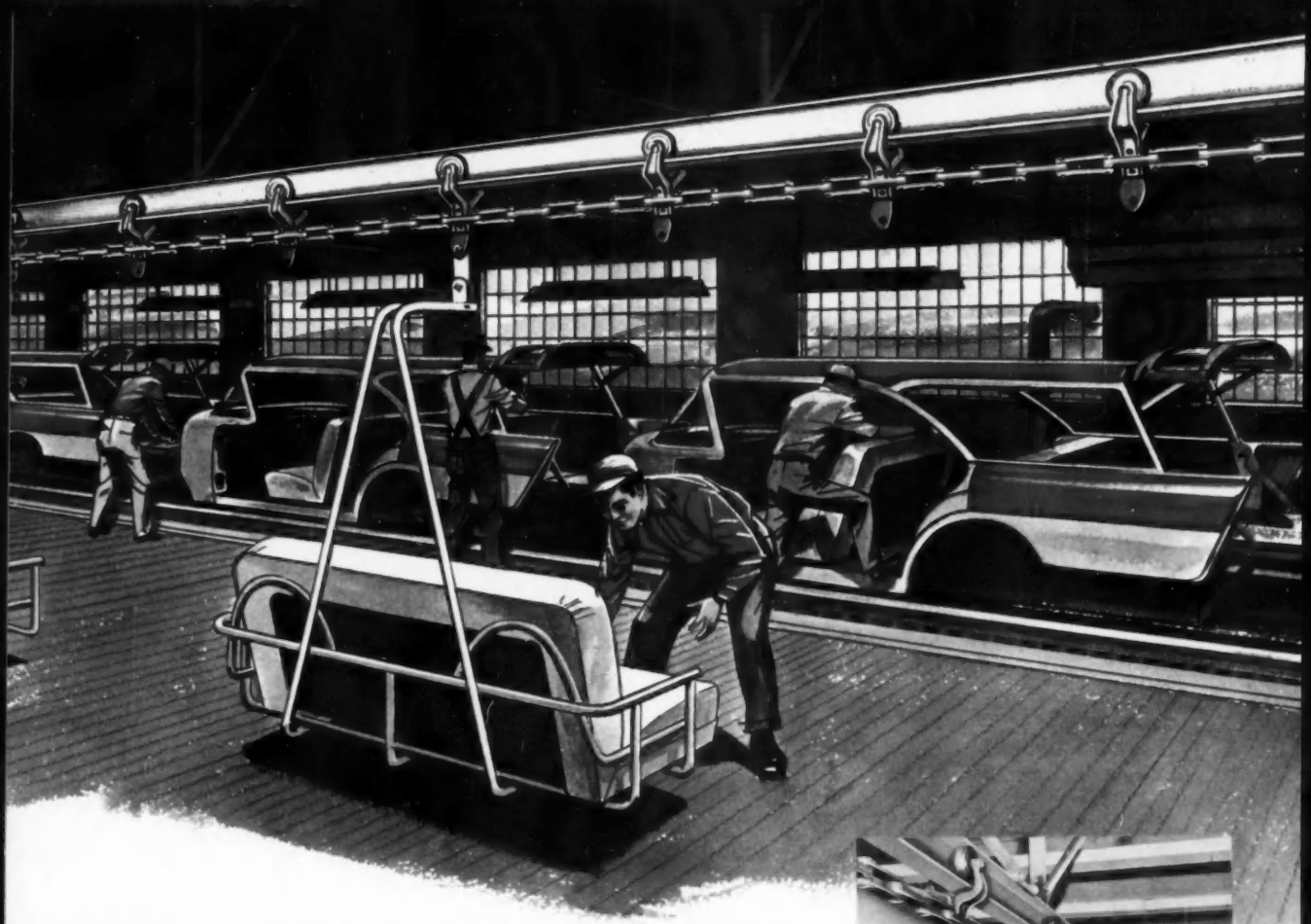
NORTHROP AIRCRAFT, INC., Hawthorne, Calif.
Military aircraft parts—$80,306 (60)
Military aircraft—$97,546 (60)
Military aircraft—$98,500 (65)

RYAN AERONAUTICAL CO., San Diego, Calif.
Military aircraft parts—$55,000 (60)

J. T. SLOCOMB CO., South Glastonbury, Conn.

UTICA DROP FORGE AND TOOL CORP., Whitestown, New York
Military jet engine parts—$1,470,000 (40)

WESTON HYDRAULICS, LTD., North Hollywood, Calif.
Military aircraft equipment—$116,852 (70)



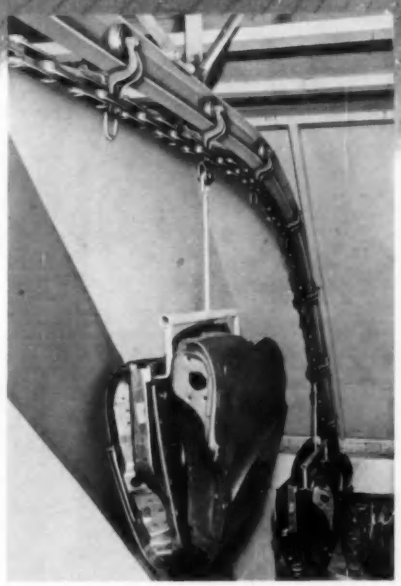
Conveyors Modernize Production Flow...

DOUBLE

Station Wagon Volume

The Ionia Manufacturing Company, Division of the Mitchell-Bentley Corp., Ionia, Michigan utilized more than 4½ miles of Webb conveyors in converting their five-floor plant into a "one-floor" assembly line. They manufacture station wagon bodies for two G.M. and one Ford Division. Forty-three Webb conveyors of four different types have transposed this plant into the acme of modern manufacturing . . . and doubled production volume.

The Jervis B. Webb Company manufactures all types of conveyors for automatic handling of any material from hairpins to raw steel. For more information on how Webb conveyors can improve your materials handling and reduce production costs, contact any Webb District Office or write direct.



The large illustration above shows a location on the third floor where a Webb Floor Type Conveyor carrying station wagon bodies is joined by a Webb Trolley Conveyor handling seat assemblies and other interior parts.

The photograph above is another view of the Trolley Conveyor coming up from the second floor . . . this time loaded with sub-assemblies for the storage area.

More details on reverse side

JERVIS B. WEBB COMPANY
SPECIALISTS IN CUSTOM CONVEYOR SYSTEMS
8937 ALPINE AVENUE • DETROIT 4, MICHIGAN

FACTORIES: DETROIT • LOS ANGELES • ATLANTA • HAMILTON, ONTARIO, CANADA • ENGLAND • FRANCE • BELGIUM • AUSTRALIA

Conveyors Modernize Production Flow... DOUBLE Station Wagon Volume

Stampings are carried to third floor from railroad receiving dock by a Webb 6" overhead trolley conveyor (1) bisecting the building. Parts go into storage (2) for controlled feeding to conveyor system. Trolley Conveyor (3) with carriers coded for scheduled parts are loaded from storage by stock handlers. In production area, small parts are removed and placed in fixtures (4) and welded into sub-assemblies. The same conveyor carries sub-assemblies to side panel assembly power and free conveyor (5) where complete side panel assemblies are welded. They are then transferred from these conveyors, placed on another trolley conveyor (6) and transported to fourth floor.

Here (7) side panel assemblies, roof tops and floor decks are positioned into body jig and gun welded. Bodies travel automatically through all phases of assembly and finishing . . . Bonderizing (8), prime (9), bake (10), wet sand (11), 1st finish coat (12), 2nd finish coat (13), polish (14) . . . On the third floor, hardware (15) and interiors are installed (16). After final inspection (17) a Webb Floor Conveyor feeds bodies to a shipping area. Here eight storage lines hold four complete truck loads ready for shipment. At this point a Webb automatic positioning body elevator loads haulaway trucks in minutes, completing the production cycle.

Ionia Manufacturing Company has good reason to be proud of their plant. With efficient conveyorizing, they have solved almost insurmountable production problems. Webb engineers, working with Ionia plant engineers, created a well organized, coordinated production flow.

JERVIS B. WEBB COMPANY
SPECIALISTS IN CUSTOM CONVEYOR SYSTEMS
DETROIT 4, MICHIGAN

IF YOUR PROBLEM IS MODERNIZING PRODUCTION FLOW . . . CALL IN A WEBB ENGINEER

More Government Contract Awards

THIS latest list of Government prime contracts that have been awarded covers the period from April 1 to April 29, 1957. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

AINSWORTH MANUFACTURING CO., Detroit, Mich.
Automotive spare parts—3824—$224,660

AIRESEARCH MANUFACTURING CO. OF ARIZONA, Div. of Garrett Corp., Phoenix, Ariz.
Air turbine starter—360—$231,920

AMERICAN BOSCH ARMA CORP., American Bosch Div., Springfield, Mass.
Aircraft accessory spare parts, 4 items —$113,945

ANDREA RADIO CORP., Long Island City, New York
Control panel and relay for aircraft—$2,369,335

AUSTIN WESTERN CO., Div. Baldwin-Lima-Hamilton Corp., Aurora, Ill.
Crane, truck mounted, 17,000 lb cap., for handling missile—$1,417,893

AVCO MANUFACTURING CORP., Lycoming Div., Williamsport, Pa.
O-480-1 aircraft engine—$1,236,175
O-480-1 aircraft engine for L23-D aircraft—$325,520

B. G. CORP., Ridgefield, New Jersey
Spark plugs—various—$162,363

THE BARDEN CORP., Danbury, Conn.
Bearings—222,896—$283,381

BAY CITY SHOVELS, INC., Bay City, Mich.
Crane-shovel, truck mounted, 6x6, 22½ ton cap., 2 engine drive, Diesel engine driven—4—$165,540

BEECH AIRCRAFT CORP., Wichita, Kans.
Remanufacture of L-23A and L-23B aircraft to L-23D configuration—$1,709,227

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.
Wheel assembly, brake assembly, for KC-135 aircraft—$1,645,074
Wheeel assemblies, for F-86H aircraft—$223,298
Wheel assemblies, brake assembly, for F-101B aircraft—$713,391
Overhaul of control & valve assemblies —Job—$88,111

BENDIX AVIATION CORP., Bendix-Skinner Div., Royal Oak, Mich.
Valve assembly, hydraulic check—1 item —$70,403

BENDIX AVIATION CORP., Red Bank Div., Eatontown, New Jersey
Generators, engine driven, for B45, F86D, F94C, C124C, C-131A, and T29C/D aircraft—$806,558
Motor generators for support of SA-16A/C-118A and T-33 aircraft—$151,-998

BLACKMER PUMP CO., Grand Rapids, Mich.
Automotive spare parts—1440—$175,680

BORG-WARNER CORP., Rockford Clutch Div., Rockford, Ill.
Disk, clutch assembly—10,976—$210,190

BREEZE CORPS., INC., Union, New Jersey
VG-600 starter generators, VG-544 blast tube assemblies for Q-2, T-37A aircraft—$688,118

CARRINGTON CO., Seattle, Wash.
Diesel engines—11—$124,100

CATERPILLAR TRACTOR CO., Peoria, Ill.
Tractor—1—$24,767

CHAMPION SPARK PLUG CO., Toledo, Ohio
Spark plug, applicable to 0-3335 engines —42,900—$55,770

CHRYSLER CORP., Detroit, Mich.
Semi-trailer van warhead unit—$1,842,-000
Automotive spare parts—$188,862

CHRYSLER MOTORS CORP., Washington, D. C.
Trucks—10—$21,798

CLEVELAND PNEUMATIC TOOL CO., Cleveland, Ohio
Parts applicable to strut assembly, C46 and B26 aircraft—$61,717

(*Turn to page* 180, *please*)

FLAT

Smooth...True...Stable

PIONEER 921-T

Cast Aluminum Tooling Plate

Flatness and a precision-machined surface finish (32 micro") ... plus 100% stability and fine grain molecular structure throughout ... adapt Pioneer 921-T Tooling Plate to any precision tooling job without preliminary milling and consequent waste of time and material. Every Pioneer 921-T plate, ¾" or thicker, is held to a flatness tolerance of ±.005" in all directions. This feature makes Pioneer 921-T the ideal tooling material where precision, time saving and low cost are important in jig and fixture fabrication. Ask your Pioneer 921-T distributor for a copy of this brochure, showing new and unusual applications.

Pioneer 921-T is available through these suppliers:

ALBUQUERQUE, N.M.: Morris Steel & Supply Co.
ATLANTA, GA.: Southern States Iron Roofing Co.
BOSTON, MASS.: American Steel & Aluminum Corp.
Joseph T. Ryerson & Son, Inc.
BIRMINGHAM, ALA.: Southern States Iron Roofing Co.
CHICAGO, ILL.: Joseph T. Ryerson & Son, Inc.
CLEVELAND, O.: Kaale Steel Corporation
DALLAS, TEX.: Vinson Steel & Aluminum Co.
DEARBORN, MICH.: Pioneer Aluminum Inc.
DENVER, COLO.: ABC Metals Corporation
DETROIT, MICH.: Kaale Steel Corporation
Meier Brass & Aluminum Co.
GRAND RAPIDS, MICH.: Kaale Steel Corporation
HARTFORD, CONN.: American Steel & Aluminum Corp.
HILLSIDE, N.J.: Edgcomb Steel & Aluminum Corp.
HOUSTON, TEX.: Vinson Steel & Aluminum Co.
JERSEY CITY, N.J.: Joseph T. Ryerson & Son, Inc.
KANSAS CITY, MO.: Industrial Metals, Inc.
LOS ANGELES, CALIF.: Braico Metals, Inc.
LOUISVILLE, KY.: Southern States Iron Roofing Co.
MEMPHIS, TENN.: Southern States Iron Roofing Co.
MIAMI, FLA.: Southern States Iron Roofing Co.
MILWAUKEE, WIS.: Joseph T. Ryerson & Son, Inc.
NASHVILLE, TENN.: Southern States Iron Roofing Co.
OAKLAND, CALIF.: Earle M. Jorgenson Co.
RALEIGH, N.C.: Southern States Iron Roofing Co.
RICHMOND, VA.: Southern States Iron Roofing Co.
ST. LOUIS, MO.: Industrial Metals, Inc.
SOUTH BEND, IND.: Kaale Steel Corporation
UNION, N.J.: Mapes & Sprowl Steel Co.
WALLINGFORD, CONN.: Joseph T. Ryerson & Son, Inc.
WICHITA, KAN.: Industrial Metals, Inc.

SALES REPRESENTATIVES:
Morris P. Kirk & Son, Inc.
4050 Horton St., Emeryville 8, Calif.
Also: Fresno, Calif.; Phoenix, Ariz.

The Norwest Company
330 Second Ave. West, Seattle 99, Wash.

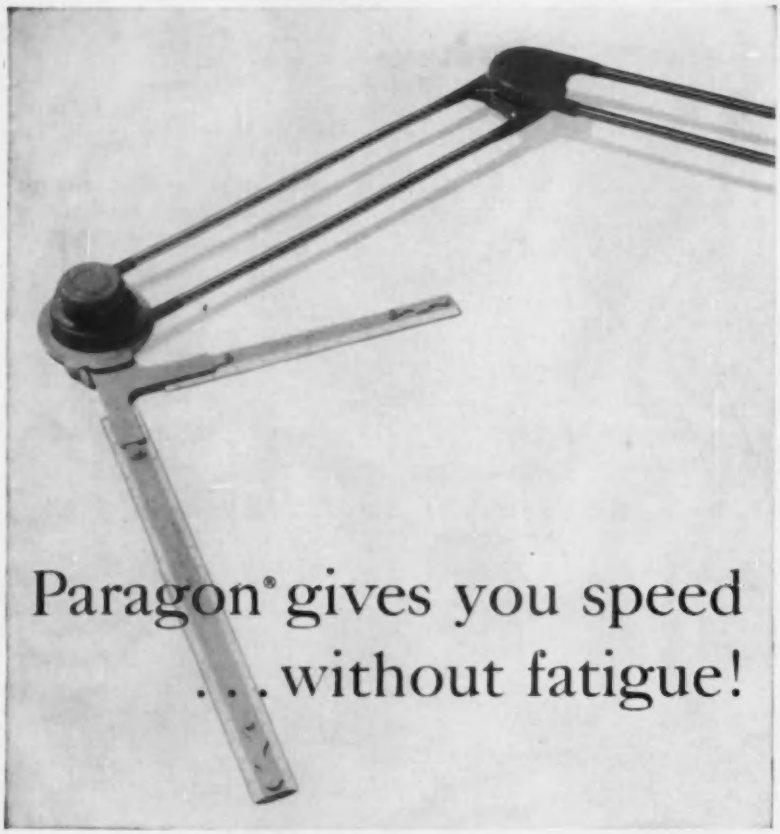
EASTERN SALES OFFICE:
Pioneer Aluminum Inc.
Richard G. Evans, Mgr.
23439 Michigan Ave., Dearborn, Mich.

SOUTHWEST REGIONAL SALES MANAGER:
Howard L. Hutchinson, P.O. Box 702, Dallas, Tex.

PIONEER ALUMINUM, INC.
Subsidiary of MORRIS P. KIRK & SON, INC.
PACIFIC COAST UNIT OF NATIONAL LEAD COMPANY
5251 West Imperial Highway • ORegon 8-7621 • Los Angeles 45, California.

TOOLING PLATE
HEATING PLATENS
VACUUM CHUCKS
EXTRUSIONS

IF YOUR PROBLEM IS MODERNIZING PRODUCTION FLOW . . . CALL IN A WEBB ENGINEER



Check the response-to-the-touch. You can actually feel the difference!

That's why the Paragon Drafting Machine noticeably cuts end-of-the-day fatigue . . . saves costly man hours . . . helps raise working standards.

See how easily protractor control ring can be reached—no matter what position your hand is in. Another time saver. Touch that ring with your *little* finger and scales rotate freely. Release pressure and scales automatically lock to nearest 15° position. And intermediate angles are just as easily set!

Top day-to-day performance is guaranteed by unique "open center" design of arms which protects smooth-working factory-set band tension.

A good look at a Paragon and a touch on that control ring is worth 1,000 words! Try it before you buy *any* drafting machine—you can *feel* the difference.

89 YEARS OF LEADERSHIP

In equipment and materials for drafting, surveying, reproduction and optical tooling . . . in slide rules and measuring tapes.

K+E KEUFFEL & ESSER CO.
NEW YORK • HOBOKEN, N. J. • Detroit • Chicago • St. Louis • Dallas • San Francisco • Los Angeles • Seattle • Montreal

(*Continued from page* 179)

CONTINENTAL AVIATION AND ENGINEERING CORP., Detroit, Mich.
Kits, modification type MA-1 compressor, air gas turbine—1525—$418,734
Product improvement on J69 series engines—$9,196,324

CONTINENTAL MOTORS CORP., Muskegon, Mich.
Engines, Packette, model PE 90-4—$637,958
Engines, Packette, model PE 200-2—$488,570
Tank engine modifications kits—various—$4,038,963

CURTISS-WRIGHT CORP., Propeller Div., Caldwell, New Jersey
Product improvement on C-133 aircraft—$382,496
Additional services and materials to overhaul and repair propellers and controls for YC-130 aircraft—$64,148
Propellers for C-133 aircraft—$3,039,004
Material and services to cover product improvement for YC-97J, C-133, C-130, XB-47D and XF-84H aircraft—$2,019,432
Prop assemblies and blade assembly for ZPG-3W and ZS2G-1 airships—$548,256

CURTISS-WRIGHT CORP., Wright Aeronautical Div., Wood-Ridge, New Jersey
59 items of special engine tools—274—$58,474
60 items of special engine tools—944—$409,425
94 items of special engine tools—82—$62,666

DONALDSON CO., INC., St. Paul, Minn.
Muffler, exhaust assembly—484—$59,092

DOUGLAS AIRCRAFT CO., INC., Santa Monica Div., Santa Monica, Calif.
Parts applicable to strut assembly, C64 and C118 aircraft—$148,720

DOUGLAS AIRCRAFT CO., Tulsa Div., Tulsa, Okla.
Field modification of (31) RB-47H aircraft—Job—$65,000

THE ELECTRIC AUTO-LITE CO., Toledo, Ohio
Coil assembly ignition—9084—$35,745
Spark plug, shielded, 14mm, resistor-suppressor (200 psi pre-ignition rating)—420,850—$206,216

FAIRCHILD ENGINE AND AIRPLANE CORP., Fairchild Aircraft Div., Hagerstown, Md.
C-123B airplanes—$7,797,000

FIRESTONE TIRE & RUBBER CO., Los Angeles, Calif.
Concurrent repair parts for missile—Job—$128,975
Concurrent repair parts for missile ground handling equipment—Job—$49,974

FORD MOTOR CO., Ford Div., Washington, D. C.
Trucks—35—$64,101

FORD MOTOR CO., Ford Div., Livonia, Mich.
Truck, chassis, ¾ ton, 4x2—291—$434,751

FORD MOTOR CO., Tractor & Implement Div., Birmingham, Mich.
Tractor, wheeled, 4x2—177—$261,508

FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.
Snowplow, rotary, truck mounted—4—$116,823

FRUEHAUF TRAILER CO., Detroit, Mich.
Container, semi-trailer van warhead unit—$160,000

GENERAL DYNAMICS CORP., Convair Div. Fort Worth, Tex.
Inspection, repair, modification, and flight test of F-102 type aircraft—$3,349,258

GENERAL ELECTRIC CO., Dayton, Ohio
Generators and control panels for aircraft B-66B/RB-66B and C-133A—$527,286

(*Turn to page* 182, *please*)

The new Wooldridge "Cobrahaul" Rear Dump Unit with Fuller 9-speed R-1150 ROADRANGER Transmission.

FULLER R-1150 ROADRANGER® Transmission standard on new Wooldridge "Cobras"!

The Fuller 9-speed R-1150 ROADRANGER Transmission is *standard equipment* in the new Wooldridge 35-ton, 275 hp diesel "Cobrahaul" Dumper and 26-yard 300 hp diesel "Cobra Quad" Scraper. Haul speeds exceed 32 miles an hour on the big 63,400 lb. unit.

Throughout the complete Wooldridge line . . . from the giant 41-yard scrapers down to and including the 7.5-to-10-yard "Cobrette," Fuller Transmissions are standard on Wooldridge Scrapers and hauling units.

Why? Only the most rugged, dependable transmissions can take the terrific shock loads—sudden starts—stops—torque reversals found in all kinds of off-highway operations from solid rock hauling to soggy swamp jobs.

Fuller Transmissions provide maximum ease of shifting ratios for faster acceleration and long life required for these operating conditions.

In Wooldridge's "Cobrahaul" and "Cobra Quad," the Fuller R-1150 ROADRANGER Transmission offers these additional advantages:

- **No gear splitting—9 selective gear ratios evenly and progressively spaced**
- **Easier, quicker shifts—38% steps between ratios**
- **One shift lever controls 9 forward and 1 reverse speeds**
- **Engines work in peak hp range with greater fuel economy**
- **Less driver fatigue—⅓ less shifting**
- **Range shifts pre-selected—automatic and synchronized**

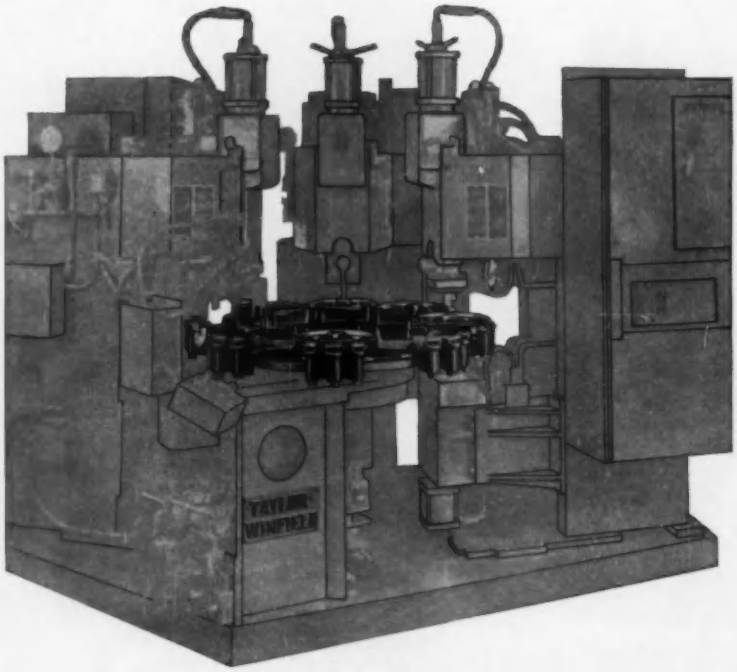
From over 110 models available for rubber-tired equipment, there's a Fuller Transmission designed to do your job.

really **where horsepower goes to work**

Fuller TRANSMISSIONS

FULLER MANUFACTURING COMPANY (Transmission Division), **KALAMAZOO, MICHIGAN**

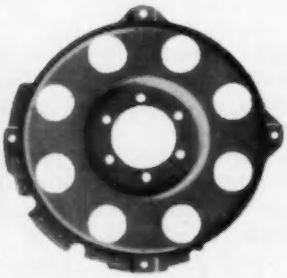
Gulf Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.



T-W Mechanized Handling Triples Standard Weld Production

Three standard projection welders, mounted around a rotary index table, assemble automobile flex-plates at 600 per hour. In service, this flex-plate connects the automobile flywheel to the crankshaft.

One operator loads three counterweights and a flex-plate on an index table fixture. The machine automatically indexes and welds the weights to the plate at three separate stations. The operator loads continuously and assemblies are unloaded automatically.



Flywheel Flex-Plate

Your use of specially-arranged standard welders readily permits modification, if required by future product design changes. Contact the nearest T-W office for prompt attention to your weld production requirements.

The TAYLOR·WINFIELD *Corporation*
WARREN, OHIO

ELECTRIC RESISTANCE AND ARC WELDING MACHINES
Sales and Service
CHARLOTTE • CHATTANOOGA • CHICAGO • CLEVELAND • DALLAS
DAYTON • DENVER • DETROIT • LOS ANGELES • PHILADELPHIA
PORTLAND, OREGON • SEATTLE • ST. LOUIS • STAMFORD
OAKVILLE AND WINDSOR, ONTARIO

(*Continued from page* 180)

GENERAL ELECTRIC CO., Erie, Pa.
Generators, aircraft engine driven, 350 amp., 30 v., DC type for C-118A aircraft—$283,798

GENERAL MOTORS CORP., AC Spark Plug Div., Milwaukee, Wis.
Modification kits applicable to A-1A & ME-5 BNC—$61,507

GENERAL MOTORS CORP., Allison Div., Aeroproducts Operations, Dayton, Ohio
Governor assemblies, regulator assemblies and valve assemblies for C-119G propeller spares—$519,560

GENERAL MOTORS CORP., Allison Div., Indianapolis, Ind.
Special tools for J-33 turbo jet engines —3—$52,425
To secure, by testing, basic data on the steer requirements of track laying vehicles—$66,405

GENERAL MOTORS CORP., Cadillac Motor Car Div., Detroit, Mich.
Cadillac limousines—9—$45,000

GENERAL MOTORS CORP., Chevrolet Motor Div., Detroit, Mich.
Truck, cargo, ½ ton, 4x2—223—truck, telephone utility, ½ ton 4x2—9—truck, cargo, ¾ ton 4x2—105—$514,459
Trucks—571—$867,115
Automobiles—8—$10,270

GENERAL MOTORS CORP., Foreign Dist. Div., New York, N. Y.
Automobiles—25—$41,404

GENERAL MOTORS CORP., GMC Truck and Coach Div., E. Pontiac, Mich.
Automotive spare parts (modification) —$2,033,883
Automotive spare parts—40,570—$151,789

GENERAL MOTORS CORP., New Departure Div., Bristol, Conn.
Bearings—86,250—$93,627

GENERAL MOTORS CORP., United Motors Service Div., Detroit, Mich.
Automotive spare parts—1569—$141,304

GENERAL TIRE & RUBBER CO., Akron, Ohio
Wheel assemblies, brake assemblies, for T-37A aircraft—$347,430

GILFILLAN BROS., INC., Los Angeles, Calif.
Aircraft accessory spare parts, 50 items —$149,809

B. F. GOODRICH CO., B. F. Goodrich Aviation Products, Dayton, Ohio
Wheel assemblies and brake assemblies for C-118A aircraft—$144,975
Spare parts for brakes for F84 aircraft —$131,791

GOODYEAR AIRCRAFT CORP., Akron, Ohio
PMAC Gafite canopies—$72,396

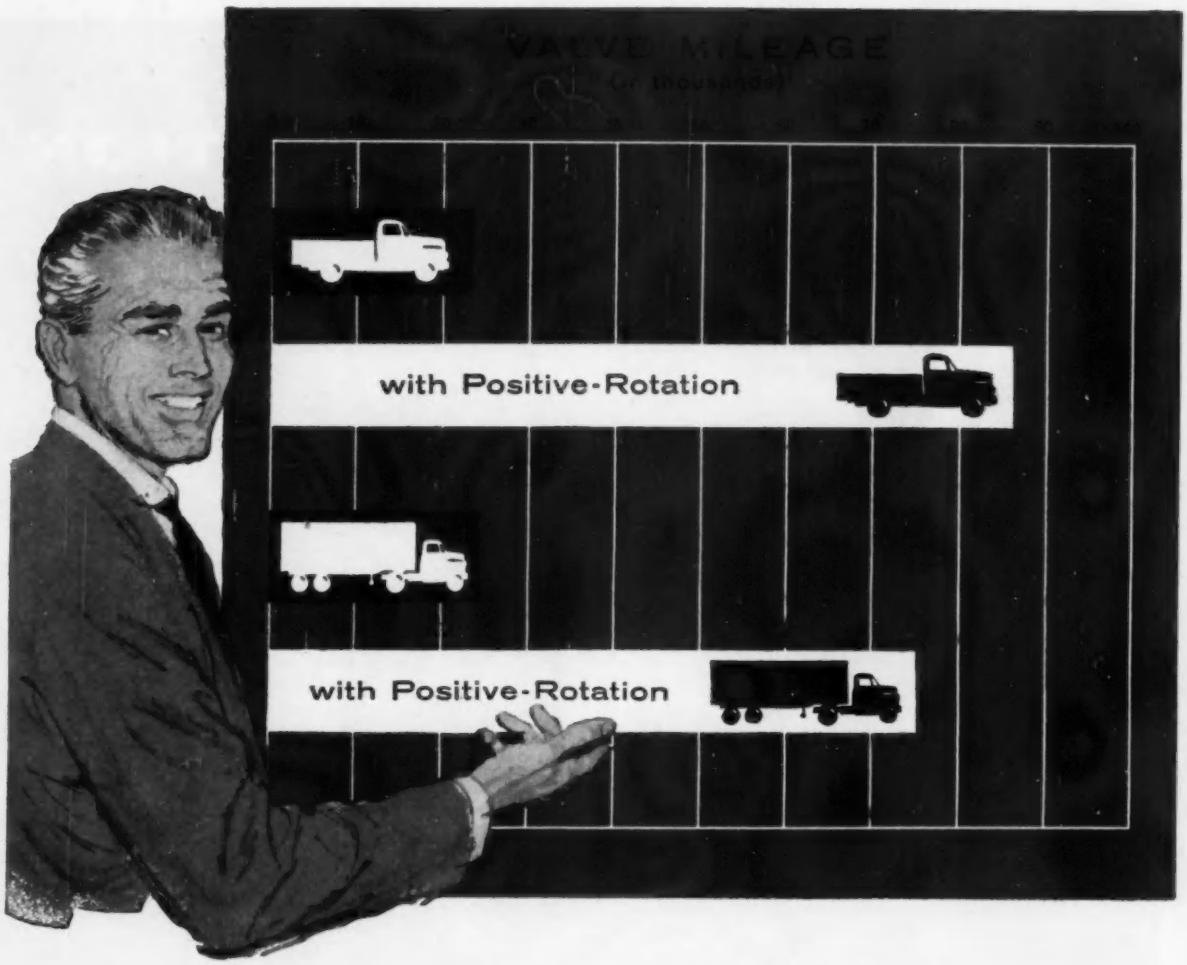
GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Spare parts for wheel and brakes; aircraft, consisting of: disk, 8196; bolt, 8976; piston, 8664; lining, 94,959; lining, 244,314; flange, 426; disk, 546; flange, 19—$625,864
Wheel assembly for C-54 aircraft—$233,689
Aircraft fuel cells applicable to F84F aircraft—$75,476

HILLER HELICOPTERS, Palo Alto, Calif.
H-23C helicopters, spare parts, special tools, and ground handling equipment —$7,278,250

HUGHES AIRCRAFT CO., Culver City, Calif.
Spare components and parts for E-series fire control system—$1,016,687

INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks—23—$72,476
Buses—2—$10,168

(*Turn to page* 186, *please*)



Any engine gives better mileage at lower cost with positive-valve-rotation

If you have been specifying Thompson *positive-rotation* only for your big, heavy-duty engines, you've been overlooking an additional maintenance-saving opportunity.

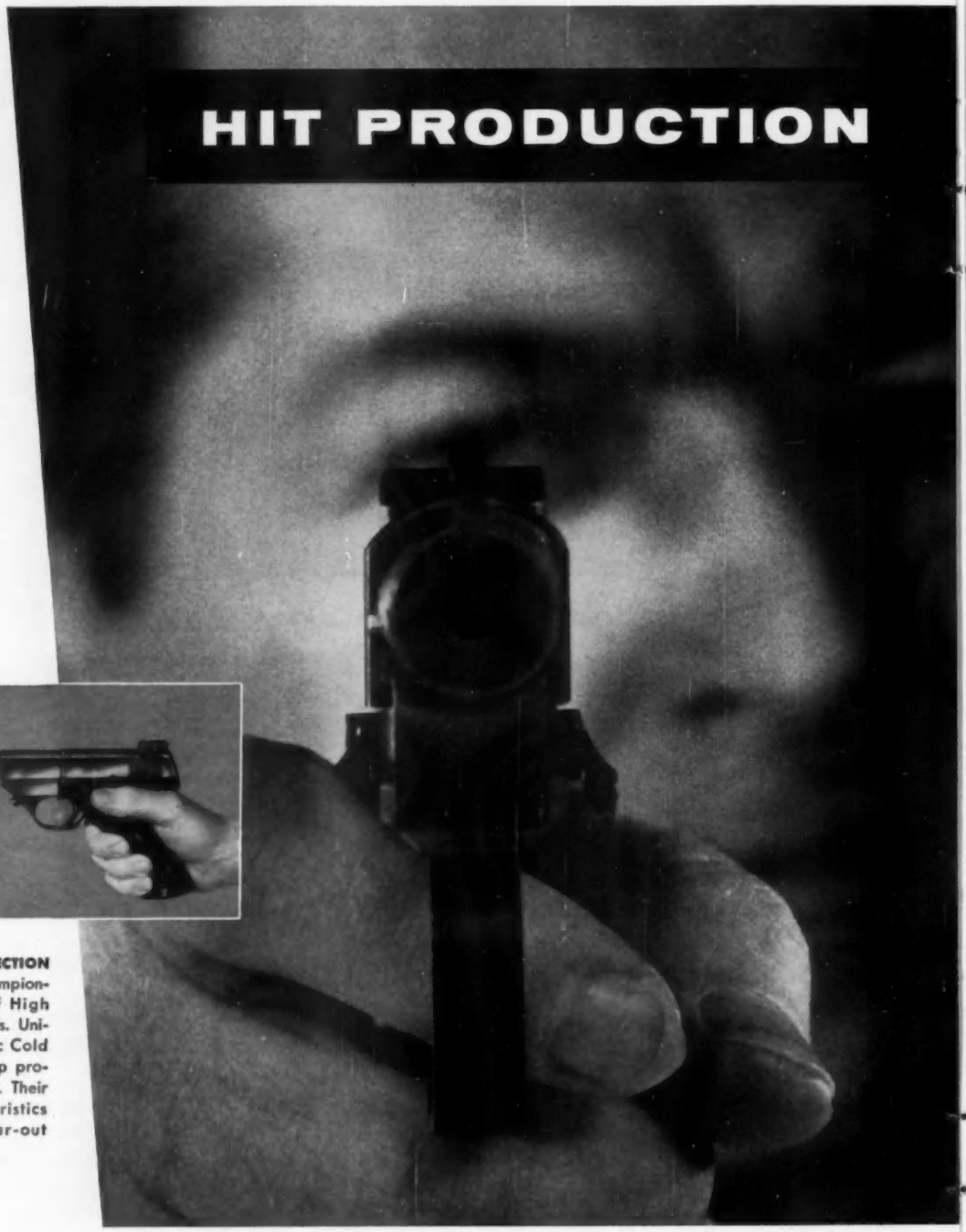
Thompson rotation will improve the performance of *any* engine, from a pick-up truck to your heaviest highway tractor. You can get Thompson *positive-rotation* as original equipment on practically any engine built by any manufacturer... just specify Thompson *positive-rotation* on your next order for trucks. The cost is so low you'll make it back promptly in the extra mileage between valve replacements, and reduced down time.

Valves close tighter longer when they are rotated a measured arc every stroke by Thompson *positive-rotation*. There's less danger of burning and channeling. Mileage between valve replacement can increase as much as 800%.

Every truck you buy deserves *positive-rotation* . . . specify either Thompson's Rotocaps or Rotocoils.

Valve Division ***Thompson Products, Inc.***

1455 EAST 185th ST. • CLEVELAND 10, OHIO



MASS-PRODUCED PERFECTION stands behind the championship performance of High Standard Target Pistols. Uniform-quality Republic Cold Finished Bars help keep production aims on-target. Their predictable characteristics provide year-in, year-out product superiority.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

TARGETS ON THE NOSE

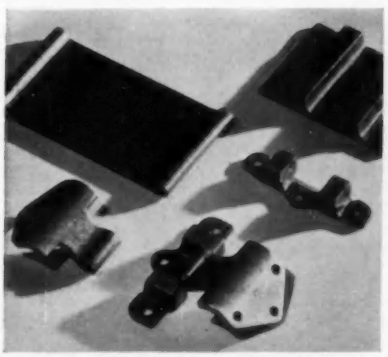
with Republic Cold Finished Steel Bars

Whatever your machined steel parts production target —greater feeds and speeds, longer tool life, better surface finish, higher strength, increased over-all economy —you'll score more bull's-eyes by using consistent, top-quality Republic Cold Finished Steel Bars.

Take the high-accuracy, .22-caliber target pistol shown on the opposite page, for example. Made by the High Standard Manufacturing Corporation, Hamden, Connecticut, it represents the ultimate in target pistol performance, winning honors in championship matches throughout the world. High Standard can afford no less than the best in craftsmanship and materials to protect their enviable reputation. Republic Cold Finished Steel Bars used for barrel stock in these pistols and other High Standard firearms, meet their most exacting specifications with flying colors.

The many advantages of Republic Cold Finished Bars have helped machined parts manufacturers in every field to zero-in on tough production problems. Their bright, smooth finish, plus extreme size-and-shape accuracy, enable machining operations to be held to a minimum—or, in some cases, to be eliminated entirely. In addition, the cold drawing process increases the machinability and physical properties of any given hot rolled analysis. Higher ultimate strength, yield point, and hardness provide product-design-and-performance benefits.

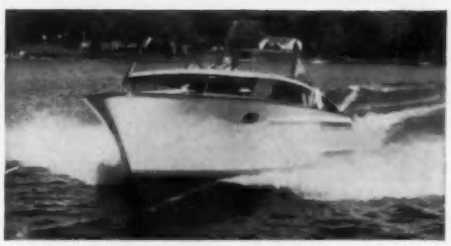
It will pay you to get the complete story on Republic Cold Finished Steel Bars in relation to your production targets. Simply call your local Republic representative or steel warehouse. Mail coupon for literature.



YOU CAN SCORE SAVINGS on many expensive-to-machine parts by taking full advantage of Republic Special Sections. Hot or cold pre-forming eliminates excess metal, reduces required finishing operations, cuts scrap to the bone. Special Sections are available in all grades of carbon, alloy and ENDURO Stainless Steel. Mail coupon for complete information.

ZERO-IN ON CORROSION and machining problems with Republic Cold Finished ENDURO® Stainless Steel Bars. ENDURO is solid—requires no applied surface to crack, flake, peel or wear away. Parts are corrosion-protected, permanently. In addition, cold drawing increases the inherent great strength and high machinability of ENDURO Stainless Steel. For information, mail coupon.

HIGH STRENGTH-TO-WEIGHT GOALS for mobile products like this steel pleasure cruiser are met with Republic High Strength Steel. Weight savings up to 30% can be made, with no sacrifice of safety or service life. Further, corrosion resistance of Republic high strength is many times that of ordinary carbon steel. Send coupon for facts.



STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. C-3818
3106 EAST 45th STREET, CLEVELAND 27, OHIO

Please send me information on:

☐ Cold Finished Steel Bars
☐ High Strength Steel
☐ Special Sections
☐ Cold Finished ENDURO Stainless Steel Bars

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

(Continued from page 182)

JACK & HEINTZ, INC., Cleveland, Ohio
Starter, aircraft direct cranking—$265,-124
Support of MD-3 generator sets, various quantities—$269,153

LACROSSE TRAILER CORP., LaCrosse, Wis.
Semitrailer, lowbed, 60 ton, 8 wheel—15—$126,225

LELAND ELECTRIC CO., Div. of American Machine & Foundry Co., Dayton, Ohio
Motor generators for Q2A, G123, B-57, F86, F100, F104, F105 and F107 aircraft—$891,457
Motor generators for B-29, C-46, C-47, F89D and SA16A aircraft—$723,766

LOCKHEED AIRCRAFT CORP., Marietta, Ga.
Testing of C-130A aircraft—$1,325,639

MACKENZIE MUFFLER CO., INC., Youngstown, Ohio
Muffler, exhaust—8289—$42,612

GLENN L. MARTIN CO., Baltimore, Md.
Installation of aircraft service changes in P5M type aircraft and modernization of such aircraft—$24,344,880

MC DONALD AIRCRAFT CORP., St. Louis, Mo.
Design, develop and installation of bladder type armament fuel cells for F-101 aircraft—$499,288

MINNEAPOLIS-MOLINE CO., Industrial Power Div., Minneapolis, Minn.
Tractor, wheeled, 4x2—32—$64,616

MONROE AUTO EQUIPMENT CO., Monroe, Mich.
Automotive spare parts—6922—$281,379

NORTHROP AIRCRAFT, INC., Hawthorne, Calif.
Conversion of F89C aircraft to tow aircraft—$386,622

PACIFIC CAR AND FOUNDRY CO., Renton, Wash.
Final drive, gear assembly, left and right—30—$77,115
Winch, rear mounted, for crawler tractors—183—$518,538

REO MOTORS, INC., Washington, D. C.
Trucks—5—$45,408

ROSS GEAR AND TOOL CO., Lafayette, Ind.
Gear, steering, hydraulic, assembly—81—$47,142

ROVER CO., LTD., Solihull, Warwickshire, England
Trucks, station wagon—11—$22,096

RYAN AERONAUTICAL CO., San Diego, Calif.
Model KDA-1 target drones—$4,733,901

SUNDSTRAND MACHINE TOOL CO., Sundstrand Aviation Div., Rockford, Ill.
Constant speed transmission, frequency and load controller, and automatic parelleling control for B-47 retrofit—$3,355,076
Transmission and gov assembly, frequency and load controller, automatic paralleling control, recirculating valve, boost pump, component spare parts; all items part of constant speed drive for F-101 aircraft—$1,231,105

SUPERIOR MAGNETO CORP., Long Island City, New York
Distributor assembly—4008—$84,368

O. E. SZEKELY AND ASSOC., INC., Commerce, Ga.
Generator set, Diesel engine—$311,207

UNITED AIRCRAFT CORP., Sikorsky Aircraft Div., Bridgeport, Conn.
HO4S-3G helicopters—$994,500

UNITED AIRCRAFT CORP., Hamilton Standard Div., Windsor Locks, Conn.
Starters, pneumatic, aircraft engine, for B-52 and KC-135 aircraft—$3,-120,800

WAYNE MANUFACTURING CO., Pomona, Calif.
Sweeper, rotary, self-propelled—158—$685,610

WESTINGHOUSE ELECTRIC CORP., Washington, D. C.
Aero 21B-1 turret system—$12,532,440
Modernization and restoration of J46-WE-8 and J46-WE-8B turbo-jet engines—$4,417,056

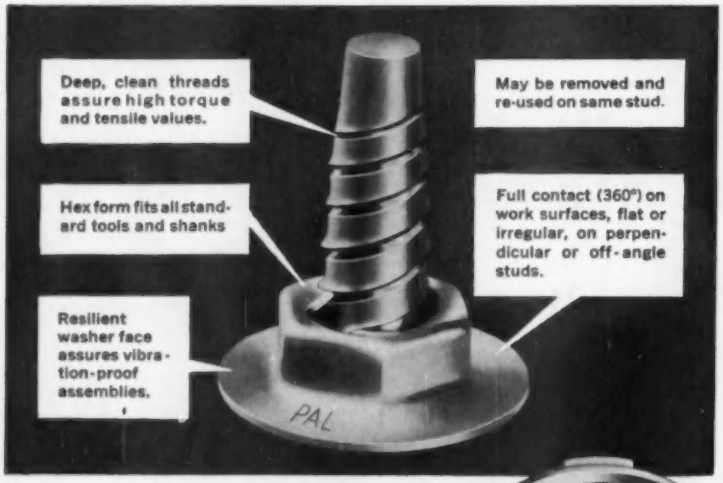
WESTINGHOUSE ELECTRIC CORP., Dayton, Ohio
Generators, regulators, rack assemblies, panels, and transformer assemblies, for KC-135 aircraft—$327,245
40 KVA generators, voltage regulators, control panels for B-47 and B-52 aircraft—$2,704,774

WILLYS MOTORS, INC., Toledo, Ohio
Trucks—47—$116,876

ZELLER CORP., Defiance, Ohio
Spark plug, shielded, 14 mm, resistor-suppressor (200 psi pre-ignition rating)—206,000—$100,940

New! PALNUT® Self-threading Nuts

Make their own threads—easily, quickly on studs of Nameplates, Medallions, Moldings, etc.


Deep, clean threads assure high torque and tensile values.
May be removed and re-used on same stud.
Hex form fits all standard tools and shanks
Full contact (360°) on work surfaces, flat or irregular, on perpendicular or off-angle studs.
Resilient washer face assures vibration-proof assemblies.
PAL

Now . . . low-cost, plain studs become strong, vibration-proof threaded assemblies by simply fastening with the new PALNUT Self-threading Nuts. You eliminate the high cost of threaded studs—your fastening operation does the thread-cutting while tightening. No special tools needed—high-speed assembly is obtained with standard tools and methods.

PALNUT Self-threading Nuts are made of spring-tempered steel, comprising a thread-cutting lock nut and flat washer in one piece. Parts are pulled up tight with a resilient spring locking action that will not loosen in service. Available in sizes for 1/8", 3/8" and 1/4" unthreaded studs.

Also available with "bonded-in" plastisol compound to seal out water and dust.

Write for free samples and descriptive literature

THE PALNUT COMPANY
Subsidiary of United-Carr Fastener Corp.
60 Glen Road, Mountainside, N. J.
Detroit office and warehouse:
730 West Eight Mile Road, Detroit 20, Mich.

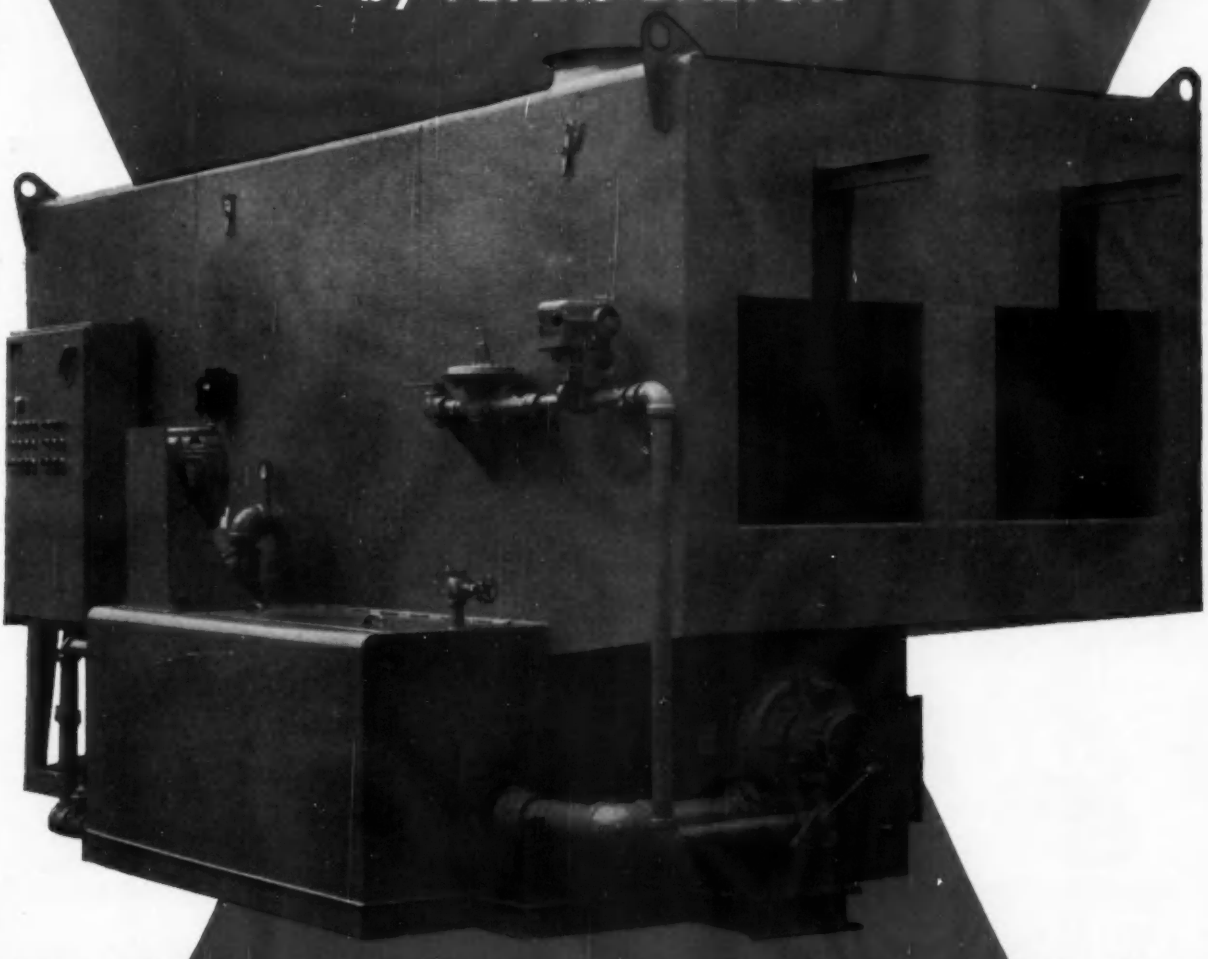
Readers of AUTOMOTIVE INDUSTRIES are always well informed

Space-Saver for . . .

2 IN 1 FINISHING OPERATIONS

Two-Pass Power Spray Washer

by PETERS-DALTON



The installation above is of a gas heated 2-Pass Power Spray Washer, designed, engineered and built by Peters-Dalton, to simultaneously accept two conveyor lines of lawn and leaf rakes. This is part of a complete P-D system. After the cleaning operations, rakes continue on their separate lines to and through dip tanks, in which each line receives a different colored paint coating. The complete P-D installation includes the 2-Pass Gas Heated Power Spray Washer, with room temperature blow-off, exhaust canopies, dip tanks and drain enclosures.

Savings effected here are obvious — not only does the washer conserve valuable plant floor space but, through the handling of two lines of parts, reduces by 50 per cent time that otherwise would be consumed in painting in separate colors.

Whatever your problems may be, you can depend, without any doubts, on the ability, service, quality and cost savings offered you by Peters-Dalton. More than a quarter century of designing, engineering, manufacturing and installing finishing equipment, of all types and sizes, assures you of finding the best and most economical way to meet your needs. Just write, wire or phone — we'll be glad to tell you more.

Representatives in Principal Cities

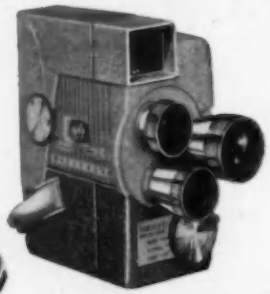
- *Hydro-Whirl Paint Spray Booths*
- *Industrial Washing Equipment*
- *Drying and Baking Ovens*
- *Hydro-Whirl Dust Collecting Systems*

PD Peters-Dalton INC.

A SUBSIDIARY OF DETROIT HARVESTER CO.

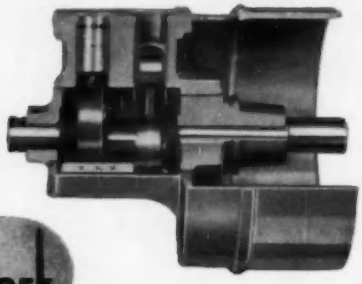
17930 Ryan Road • Detroit 12, Michigan

5-57



Revere

. . . makes camera parts *light-tight* and *interchangeable*

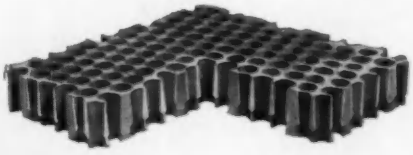


York

. . . combines motor and compressor into *one-piece* housing

Black & Decker

. . . cuts finishing of power tools to *one buffing* operation



E.W. Blatchford

. . . makes "Honeycomb" printing base in *only way* it could be done

Regina

. . . concentrates *weight where needed* in floor waxer

Sunbeam

. . . closely *matches section thicknesses* to strength requirements of appliances

A dozen blue-chip products Doehler-Jarvis die-

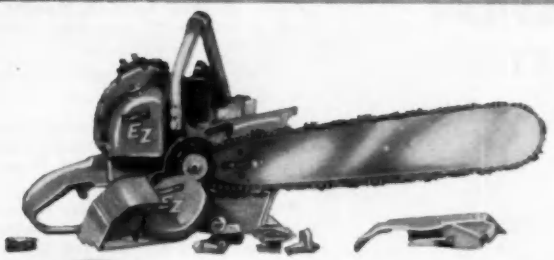
Each of these twelve products is outstanding in design.

One is extra light. Another is unique for precision. A third is remarkable for space economy. Each has a key feature that helps make it a success.

All these patterns of success are variations on a single theme . . . the skillful use of Doehler-Jarvis die castings to achieve design objectives.

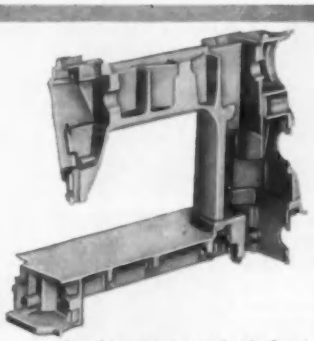
In each case, the manufacturer brought Doehler-Jarvis into the design picture at an early stage. Customer and D-J engineers worked out the specifics . . . the basic contours, the section, the coring, the ribbing, the ejection lugs, machining base points, finish . . . all the fine points.

Design results have been enviable. And frequently there have been important side benefits . . . metal saved, machining and assembly operations by-passed, finishing steps reduced, rejects prevented.



HOMELITE

. . . packs 5 horsepower into chain saw weighing *only 19 pounds*

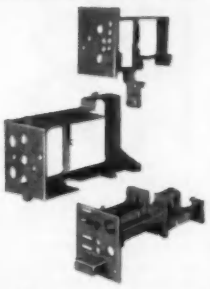


SINGER

. . develops new standards for *3-dimensional* precision in sewing machine assemblies

Underwood

. . . replaces *six* typewriter frame castings with *one*

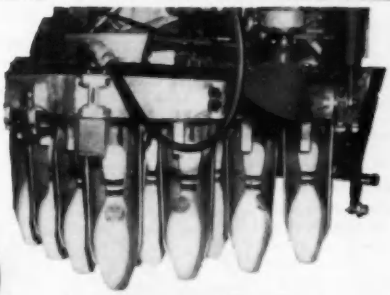


Western Electric

. . . makes *one* unit of space do the work of *six* in telephone terminal equipment

Sears Roebuck

. . . designs mower housing for *built-in assembly savings*



AMF

. . *eliminates nearly all machining* in 99 pinspotter parts

illustrate a dozen ways castings improve product design

Take your cue from the makers of these successful products

If you're looking for ways to improve your product, lower its cost, or speed its production . . . or if you're developing new devices . . . do what the makers of the products shown above did. Call in Doehler-Jarvis.

We'll be glad to help you evaluate the possibilities for you in die castings.

Doehler-Jarvis

DIVISION OF NATIONAL LEAD COMPANY

General Offices: Toledo 1, Ohio

In Canada:

Barber Die Casting Co. Limited

Hamilton, Ontario

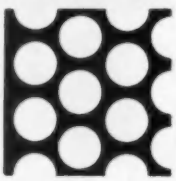
TRADE MARK

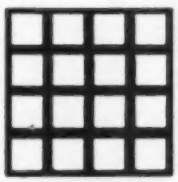
H&K PERFORATED MATERIALS

Utility • Beauty • Economy
FOR TOMORROW'S PRODUCTS

A MEDIUM OF LIMITLESS APPLICATIONS

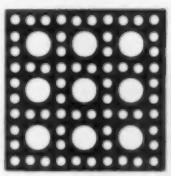
Designers are discovering an ever-increasing range of applications for perforated materials. For functional or decorative purposes, or where a combination of both is essential, H & K perforated materials are used in more products, in more accessories, in more places than ever before.





REDUCES TOOLING COSTS

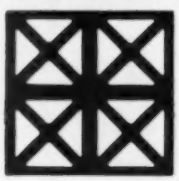
Design, pattern and open area for almost every application may be selected from our thousands of perforating dies—at no charge for tooling. (Tools for special designs can be built to order.)



MATERIALS PERFORATED

Harrington & King can perforate practically any metallic or non-metallic material that can be obtained in coils, sheets or plates . . . from foil-thin to 1" thick.

H & K engineers will be pleased to work with you on your requirements.



See our catalog in Sweet's Product Design File.

FIND NEAREST H&K AGENT in the 'Yellow Pages'

Listed Under "Perforated Metals"

Fill in and mail coupon to the nearest H & K office.

THE Harrington & King PERFORATING CO. INC.

Chicago Office and Warehouse
5630 Fillmore Street
Chicago 44, Ill.

New York Office and Warehouse
106 Liberty Street
New York, N.Y.

Please send me—

☐ GENERAL CATALOG NO. 62

☐ STOCK LIST of Perforated Steel Sheets

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

AVIATION INDUSTRIES

(*Continued from page* 96)

the turbo-catapult, were launched into the air in less than one-fifth of their normal take-off runs.

Powered by six jet engines, the turbo-catapult develops 60,000 hp. But, despite this enormous power output, the jet power plant is expeditionary, that is, it can be dismantled with comparative ease, and transported by air to fields where it is needed.

New Missile Engine Plant

Marquardt Aircraft Co. of Van Nuys, Calif., is completing a new plant at Ogden, Utah, to produce supersonic ramjet engines for the U. S. Air Force. These engines will be used to power the Bomarc interceptor missile developed by Boeing Airplane Co. of Seattle, Wash. Marquardt has also started a design of a Government-furnished production test facility, also planned for the Ogden site. This is a fast growing company. Net earnings for 1956 were $605,000 after taxes, equal to $2.35 per share and up 80 per cent from 1955 earnings. As of February, 1957, the company's backlog stood at $55,000,000.

In addition to ramjet development and production, Marquardt is active in the fields of turbojet control accessories, jet engine afterburners, reverse jet thrust devices, and is a prime contractor in the Air Force Nuclear Propulsion program.

Interceptor Scrambles

According to Gen. Benjamin W. Chidlaw (USAF, Ret.), vice-president of Thompson Products, Inc., Cleveland, Ohio, and former head of the Continental Air-Defense Command, the U. S. is now on an "increased intelligence" status against air attack and has been since the Suez Canal crisis which began last October.

Every unknown aircraft (usually friendly planes off course or unreported) is being double checked by ADC interceptor planes. Dur-

(Advertisement)

In 1883, Gottlieb Daimler built the world's first high revolution gasoline engine.

In 1884, Karl Benz obtained the world's first patent for a motor vehicle.

In 1926, these two pioneering manufacturers joined in a merger to form the present Daimler-Benz A. G., Stuttgart, West Germany.

Today, Daimler-Benz builds the world's finest automobiles — the Mercedes-Benz — and produces diesel powered trucks and tractors, and diesel engines from 10 to 3000 horsepower for marine, rail and industrial uses.

The company exports from Germany to 128 foreign countries through more than 1,100 agencies and distributors and operates assembly and production facilities in 27 foreign countries.

Daimler-Benz today employs 53,000 in Germany and an additional 13,000 outside Germany.

Sales in 1956 were $392,000,000.

In 1903, Orville and Wilbur Wright flew for the first time in history with an airplane and engine of their own design. Glenn H. Curtiss pioneered in aircraft development during the same period.

In 1929, the Curtiss-Wright Corporation was formed by merging the companies founded by the Wright Brothers and Curtiss.

Today, Curtiss-Wright is a leading producer of aircraft engines, missiles, propellers, electronic flight simulators, and other aircraft equipment for the military and the commercial airlines, as well as products in the fields of electronics, ultrasonics, nucleonics, thermodynamics, plastics and metallurgy. The fastest airliners in operation today are powered by Curtiss-Wright engines. A Curtiss-Wright rocket engine powered the Bell X2 to world speed and altitude records.

Curtiss-Wright employs 32,000 in 17 divisions and subsidiaries in the United States and two foreign countries and exports products throughout the world.

Sales in 1956 were $571,000,000.

Beginning as wagon manufacturers in 1852, the Studebaker Brothers produced a 16 horsepower gasoline powered car in 1904 at South Bend, Indiana.

In 1899, the Packard Motor Company produced a 12 horsepower car at Warren, Ohio.

In 1954, Studebaker-Packard Corporation was formed through a combination of these two companies. Today, Studebaker-Packard Corporation manufactures a complete line of passenger cars, trucks, and station-wagons which are distributed throughout the world and sold by more than 2,400 dealers in the United States and Canada. The company pioneered modern supercharged engines, low silhouette jet styling, twin-traction rear axles, torsion springing and finned, air-cooled brakes.

The company's products are assembled in plants operating in 11 foreign countries.

Studebaker-Packard Corporation employs 9,000 at South Bend, Indiana.

Sales in 1956 were $303,000,000.

(Advertisement)

DAIMLER-BENZ CURTISS-WRIGHT Studebaker-Packard

These three companies employing 107,000 people, with sales in 1956 totaling one billion, two hundred sixty-six million dollars, announce the signing of agreements providing for a fully-integrated program of engineering, production, sales and service of automotive vehicles; automotive, marine and industrial gasoline and diesel engines; and diesel and gasoline fuel injection systems. All of these companies have been associated for years with quality, precision manufacture and high-performance products.

Pursuant to these agreements, Daimler-Benz and Curtiss-Wright have formed an American company — Curtiss-Wright and Mercedes-Benz, Inc. — to provide for the development and sale of Daimler-Benz products in the United States, Canada, Mexico and Cuba.

Studebaker-Packard Corporation in signing the agreements will now make available to its dealers a full line of domestic and imported sports cars, convertibles, sedans and station wagons — ranging in price from under $2,000 up to $13,000 — gasoline and diesel powered trucks and all-wheel drive utility vehicles.

Mercedes-Benz cars and distinctive Mercedes-Benz features — such as fine coachwork, swing axles and transmissions — will be exclusive to Studebaker-Packard.

The Utica-Bend Division of Curtiss-Wright Corporation, now building diesel engines for the U. S. Navy, will import and manufacture Mercedes-Benz diesel engines and diesel and gasoline engine fuel injection systems under the agreements. The engines will range from a 4-cylinder model of 25 h.p. to a supercharged 8-cylinder model of 600 h.p.

Further agreements are being negotiated between Daimler-Benz and Curtiss-Wright Corporation for the interchange of rights for the manufacture of aircraft products.

Carl F. Giese
President, Daimler-Benz of North America, Inc.

Roy T. Hurley
Chairman and President, Curtiss-Wright Corporation

H. E. Churchill
President, Studebaker-Packard Corporation

ing February an average of 15 to 18 scrambles a day were made.

Aircraft Sales

From the Aircraft Industries Association of America we learn the largest 12 airframe companies in the U. S. recorded a nine per cent increase in sales last year when compared with 1955, but earnings after taxes dropped by about 12 per cent, statistics show. The 12 manufacturers reported sales totaling $5,637 million for 1956 (as against $5,188 million in 1955) but the net profit dipped from $178.8 million in 1955 to $156.5 million last year. Sales in 1956 were only $129 million below the World War II peak.

INCOME ACCOUNTS, 12 MAJOR AIRFRAME COMPANIES 1950-1956

(Millions of Dollars)

	1950	1951	1952	1953	1954	1955	1956
	Operations Subject to Renegotiation						
Net Sales	$1388.2	$1979.3	$3731.1	$5120.1	$4926.8	$5188.1	$5637.1
Operating Profit	110.2	93.9	221.8	324.5	370.8	360.5	326.6
Total Income	111.1	99.1	220.5	317.1	371.0	370.7	328.1
Contingencies	...	...	...	...	...	...	...
Total Federal Taxes, Net	48.5	68.0	138.8	200.5	188.4	191.9	171.6
Net Profit	62.6	30.9	81.7	116.6	182.6	178.8	156.5

Aircraft manufacturers are continuing to reinvest the major portion of their net earnings in new facilities. For the past two years, the 12 major airframe companies have been plowing back about 60 per cent of their profits, one of the highest reinvestment rates in the country. By comparison, the 12 largest non-aircraft manufacturers used 45 per cent in 1955 and 41 per cent in 1956 for expansion.

F-106-B All Weather Interceptor

A $47,000,000 contract for supersonic F-106B all-weather interceptors has been awarded to Convair Division of General Dynamics Corp. by the U. S. Air Force. The new F-106B is a sister ship to the delta-wing F-106A for which $216 million worth of contracts were announced in January. Prototypes of the F-106A, which carries the most sophisticated armament and fire control system yet developed for an interceptor aircraft, have been undergoing flight test at Edwards Air Force Base, Calif., since last December.

Convair will produce the F-106A and F-106B at its San Diego plant, which also is the home of the F-102A supersonic all-weather interceptors. The F-102A's, now in peak production, are already in service with squadrons of the Air Defense Command.

Largest Elevators

The largest elevators in the world (big enough to carry 2000 people) are to be installed in the Navy's new super carrier Kitty Hawk. The elevators are designed to feed 40-ton bombers to the flight deck at the rate of one per minute.

STILL *THE* QUALITY LAMP

...AFTER FIFTY YEARS!

5040-S (6-Volt)
5400-S (12-Volt)
5440-S (12-Volt)

Tung-Sol standards of lamp design and production have more than met the performance requirements of American vehicle-makers for more than half a century.

STANDARD 7-INCH VISION-AID HEADLAMPS FOR PASSENGER CARS

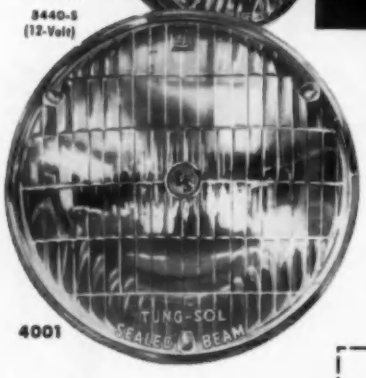
Fully up to every design specification for modern driving conditions. 5040-S (6-volt) 5400-S (12-volt).

SPECIAL 7-INCH VISION-AID FOR HEAVY DUTY TRUCK AND BUS USE

Ruggedized 5440-S has exclusive design features to meet excessively rough service conditions.

5¾-INCH VISION-AID HEADLAMPS FOR 4-HEADLIGHT CARS

4001 with single high beam filament.
4002 with double (high and low) beam filaments.



4001

4002

MINIATURE LAMPS

A type for every design requirement—Passenger Car or Truck.

STILL THE QUALITY FLASHER AFTER 18 YEARS!

The reliability that has characterized Tung-Sol flasher performance since the first installation, continues to set the standards for the industry.

TUNG-SOL®
AUTO LAMPS • SIGNAL FLASHERS

TUNG-SOL ELECTRIC INC., NEWARK 4, NEW JERSEY

EXECUTIVES READ AUTOMOTIVE INDUSTRIES

. . . for greater safety . . . LONGER

LINEAR KEEPS THE POWER IN POWER STEERING
with Roto-Mold "O" Rings

Power steering design engineers needed *lasting* seals of uniform physicals and dimensions to withstand actuating fluid pressure—mechanical wear—abuse—and chemical action. LINEAR developed precision seals for that application—to keep the power in power steering.

LINEAR'S ability to produce precision "O" rings in the most modern elastomers has helped solve a wide variety of sealing problems involving extreme ranges of temperature, pressure and destructive fluids. The exclusive Roto-Mold process assures top quality production—maximum economy—fast delivery schedules.

When it's a sealing problem, call on LINEAR or one of its agents for engineering assistance—and be sure to specify LINEAR Roto-Mold "O" Rings.

"PERFECTION IN RUBBER"

LINEAR

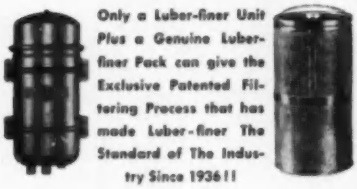
LINEAR, Inc., STATE ROAD & LEVICK ST., PHILA. 35, PA.

THERE'S NO SUBSTITUTE for LUBER-FINER'S ENGINEERED PROTECTION

YES! IT'S WHAT'S **INSIDE** THAT COUNTS

The Efficiency of Luber-finer's Exclusive Patented Process HAS NEVER BEEN EQUALLED!

USE ONLY GENUINE Luber-finer DIESELPAKS



Only a Luber-finer Unit Plus a Genuine Luber-finer Pack can give the Exclusive Patented Filtering Process that has made Luber-finer The Standard of The Industry Since 1936!!

THERE'S A LUBER-FINER MODEL FOR EVERY TYPE OF ENGINE— EVERY TYPE OF OIL!!

LUBER-FINER PACKS AVAILABLE

1. REFINING PACK

Introduced to the public in 1935 for use with straight mineral oils, fuel oils, hydraulic oils, and inhibited industrial oils.

2. DIESELPAK

First made available in 1941, the DIESELPAK was primarily designed for use with H.D. detergent compounded oils and has also achieved outstanding results when used with fuel oils and straight mineral oils.

DON'T BE MISLED BY PRICE ALONE!

There is no substitute for DIESELPAK'S Patented Filtering Process for H.D. Compounded oils AT ANY PRICE!

The DIESELPAK cleans more oil faster —keeps it CLEAN longer—and gives more service and better engineered protection than ANY of the substitute filtering elements being offered for Luber-finer units.

IT PAYS TO GET THE BEST!

STANDARD OF THE INDUSTRY SINCE 1936

Luber-finer Units are Standard and Optional Equipment on America's Leading Diesel Trucks, Tractors, Stationary Engines.

Write for Complete Information to Dept. 34

LUBER-FINER, INC.
2514 S. Grand Ave., Los Angeles 7

MEN *in the* NEWS

(*Continued from page* 41)

De Soto Div., Chrysler Corp.—**Clarence E. Knobel** has been promoted to assistant comptroller, and **Roman A. Brooks** has been made assistant director of car distribution.

Ionia Mfg. Co.—**F. R. Hook** has been appointed assistant general manager.

Crucible Steel Co. of America, Stainless Steel Sales Div.—**William B. Downes** was named manager.

Trecker Aircraft Corp.—**Carl B. Wooten** was named executive vice-president, and **Earle W. Barry** was made vice-president in charge of sales in the Latin American countries.

American Steel & Wire Div., U. S. Steel Corp.—**Edmond J. Walsh** is now manager of manufacturers products sales; **Raymond F. Nelson,** assistant manager in the same sales section; and **Charles W. Meyers,** director. Product Planning & Development Div. of the General Sales Dept.

Clark Equipment Co.—**Steve Ragsdale** is now manager of development for the Materials Handling Development Center.

Tuthill Pump Co.—**M. J. McCaughey** was made Chicago regional sales manager.

Yale Materials Handling Div., Yale & Towne Mfg. Co.—**John T. McCarley** has been named general manager of the new West Coast manufacturing plant.

Joseph T. Ryerson & Son, Inc.—**Hardie W. Beck** has been appointed sales manager for the Pittsburgh steel service plant; **Milton C. Fidgeon,** assistant sales manager of its New York area steel service plant; **Jack R. Freiday,** manager of traffic contracts; and **Glen H. Reno,** manager of traffic rates and claims.

Walworth Co.—**John C. Wallace** was made vice-president of engineering.

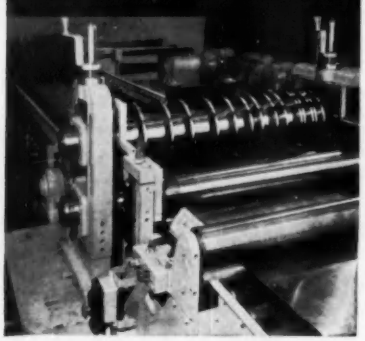
General Electric Co.—**Edward L. Boersig** has been made manager of component sales for the Metallurgical Products Dept.

National Twist Drill & Tool Co.—**Carl J. Oxford, Jr.,** has been named director of research.

General Motors Corp.—**James L. Tolley** is now director of the GM Previews of Progress.

Ipsen Industries, Inc.—**William F. Ross** was named marketing manager.

YODER SLITTING LINES



PAY BIG DIVIDENDS WORKING ONLY ONE DAY PER WEEK!

In one plant, two Yoder tube mills and about 50 punch presses are being supplied with slit strands by one Yoder Slitting Line operated an average of only *seven hours per week.*

In another plant, a Yoder slitting line, *operated from six to eight hours per week,* is supplying two intermittently operated roll forming machines with total requirements averaging 100,000 feet per week.

These typical examples demonstrate, first, the big potential output of a relatively small, inexpensive Yoder standardized Slitting Line and, secondly, its big profitability. Assume production of only 35 tons of slit strands per 8 hour shift, one day per week, and the total per year would be 1750 tons. Estimating the saving in slitting cost at only one-half cent per lb., the total annual saving would be $17,500.00.

Besides the big convenience of doing your own slitting, such savings will often repay the investment in a few months.

The Yoder Slitter Book **is a comprehensive treatise on slitter operation and economics, with time studies, cost analyses and other useful data. It is yours for the asking.**

THE YODER COMPANY
5553 Walworth Avenue • Cleveland 2, Ohio, U.S.A.

ENGINEERING YODER MANUFACTURING SLITTING LINES

ORIGINAL EQUIPMENT MANUFACTURERS who have done business with BCA have told us they find our approach to their ball bearings problems unusually helpful. Our long and specialized bearing experience plus our manufacturing flexibility can work to your advantage in terms of improved product performance and production economies. Bearings Company of America Division, Federal-Mogul-Bower Bearings, Inc., Lancaster, Pa.

FREE! BCA "Engineering Handbook." Available to engineers without cost. Write on your company letterhead.

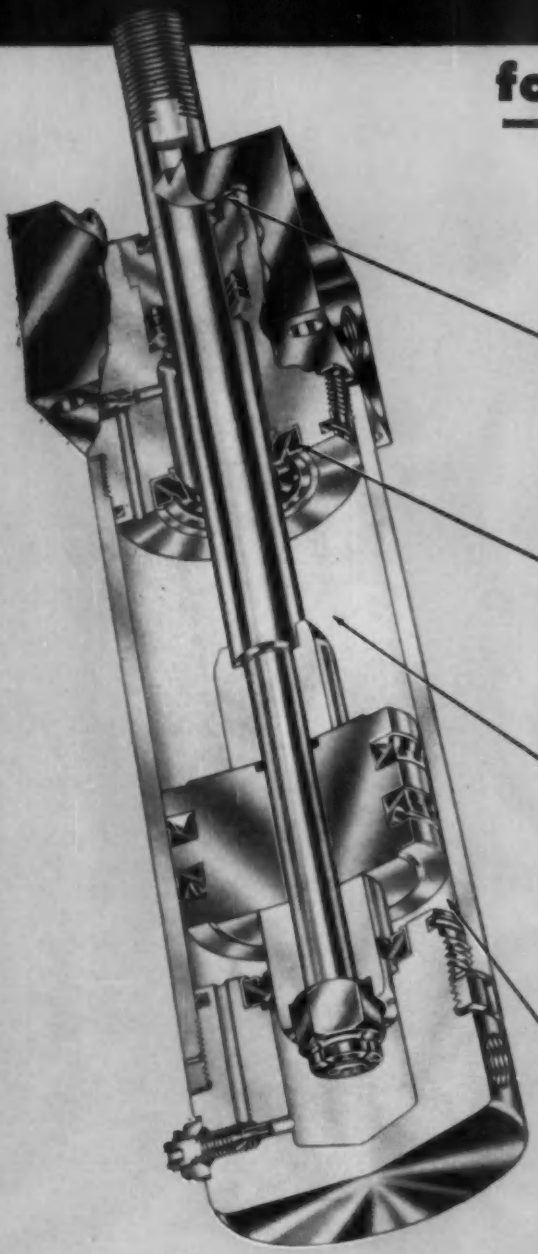
BCA Division

Federal-Mogul-Bower Bearings, Inc.

Need a cylinder today?

for all these Extras . . .

T-J Spacemaker



PISTON ROD SCRAPER . . . Not just a felt or fabric wiper, but a metal to metal contact. Protects rod packing and cylinder bores at all times by actually removing foreign particles from piston rod surface. STANDARD AT NO EXTRA COST!

NEW "SUPER" CUSHION FOR AIR . . . Of T-J design and patent, it assures millions of trouble-free cycles. Years of T-J research and test have answered the problem of "how to make a cushion last". All T-J cushions are adjustable, STANDARD AT NO EXTRA COST!

CHROME PLATED CYLINDER BORES AND PISTON RODS . . . The piston rod, of course. But of these two features, the chrome plated bore is by far the most important, due to the much greater area that is subject to wear. Chrome plating of bore gives extra protection where needed most. Also a protection from condensation and foreign matter, that may find itself into the system. STANDARD AT NO EXTRA COST!

ONE PIECE PISTON . . . Giving you three point surface bearing which increases the distance from the piston end to the rod bearing. This T-J feature assures better alignment, longer bearing and packing life. STANDARD AT NO EXTRA COST!

off shelf delivery

. . . Just call T-J

at no Extra Cost!

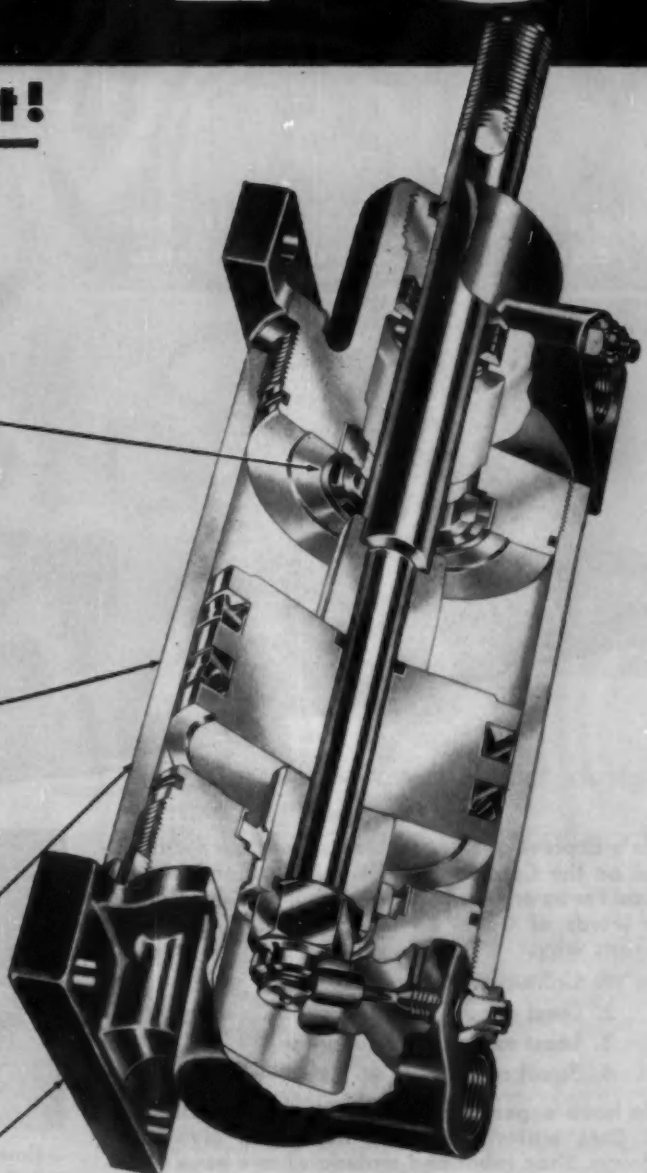
cylinders

NEW "SELF-ALIGNING" MASTER CUSHION FOR HYDRAULIC USE . . . (Pat. Applied For) New T-J cushion design eliminates problems of worn out, or out-of-line cushion seals. Eliminates need of a ball check while greatly increasing the return flow, assuring fast breakaway on return stroke. All T-J cushions are adjustable, STANDARD AT NO EXTRA COST!

NO TIE RODS TO STRETCH . . . By eliminating tie rods, the T-J SPACEMAKER gives you 360 degree port rotation, streamlined design, no tie rod stretch, without sacrificing strength. STANDARD AT NO EXTRA COST!

STREAMLINED DESIGN . . . Minimum center-line to center-line mounting—years ahead and in keeping with modern trends. Easy to clean for an extra appearance on your machine, without sacrificing strength. Oil pressure to 750 P. S. I.—air to 200 P. S. I. STANDARD AT NO EXTRA COST!

FORGED SOLID STEEL HEADS . . . (4″ bore through 8″ bore) Requires no additional mounting brackets, because mounting holes are a part of the one piece solid forged steel head. Its design lends itself to smooth streamlined modern appearance. STANDARD AT NO EXTRA COST!



WRITE TODAY for new bulletin with complete details of the T-J Spacemaker line, or call Jackson, Michigan, State 2-0462.

MEMBER OF THE NATIONAL FLUID POWER ASSOCIATION

THE TOMKINS-JOHNSON CO.

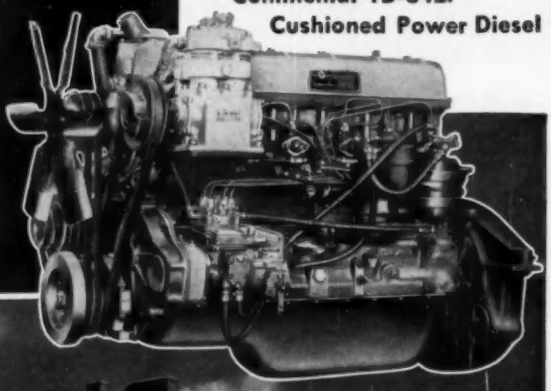
JACKSON, MICHIGAN

RIVITORS . . . AIR AND HYDRAULIC CYLINDERS . . . REAMERS . . . CUTTERS . . . CLINCHORS

there are hundreds of ways in which Industry uses **SPIROLOX** to solve retaining problems

CONTINENTAL ® CUSHIONED POWER DIESELS

"paid for themselves in one year in fuel savings alone"



Continental TD-6427
Cushioned Power Diesel

Cole's Express of Bangor, Maine has now standardized on the Continental TD-6427 Cushioned Power Diesel for its entire fleet of highway haulers. Here, in the words of Galen L. Cole, its president, are the reasons why:

1. **Lightest on the market**
2. **Least expensive to purchase initially**
3. **Least expensive to overhaul**
4. **Equal or superior in fuel economy**

"We have experimented with many other Diesels," Mr. Cole writes, "but find none that give better mileage. Shop labor and materials have been down. We changed many gasoline engines to this Diesel, and at the end of the first year's operation, had completely paid for the new engines by the saving in fuel costs alone."

Handsome orange-and-silver Cole units like this one, with blue, red and white seal and green map, are now familiar sights along the Eastern Seaboard. They are a striking advertisement not only for the State of Maine but also for dependable Continental Diesel power.

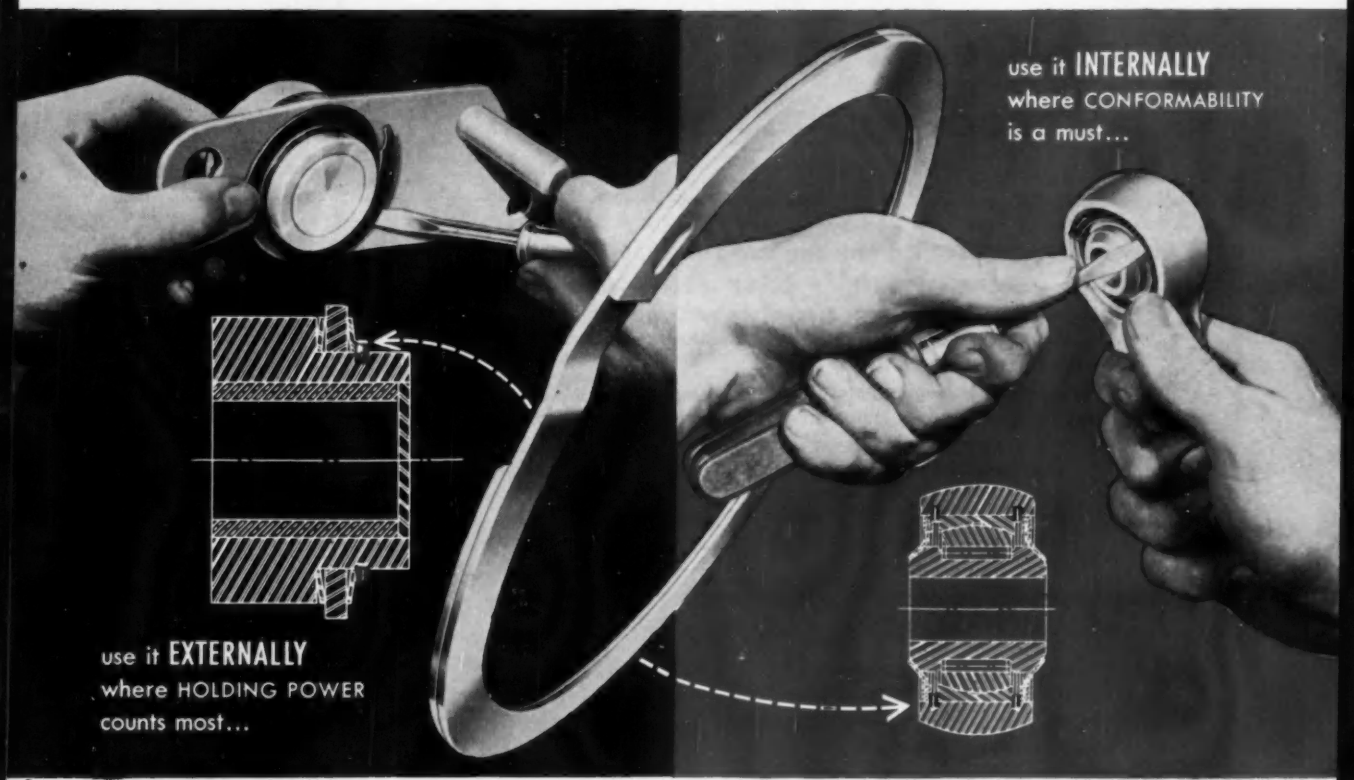
SERVICE FACILITIES AND GENUINE RED SEAL PARTS ARE AVAILABLE EVERYWHERE

Continental Motors Corporation
MUSKEGON • MICHIGAN

CONTINENTAL MOTORS ® Powerful as the Nation AMERICA'S STANDARD

6 EAST 45TH STREET, NEW YORK 17, NEW YORK • 6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3817 SOUTH SANTA FE AVENUE, LOS ANGELES 58, CALIFORNIA • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GEORGIA

there are hundreds of ways in which Industry uses **SPIROLOX** to solve retaining problems



use "easy-in, easy-out" SpiralOlox for compact design, removal of trouble-spots, elimination of costly machining and awkward parts!

The two application pictures above show how simply and effectively cylindrical parts assemblies are positioned and locked by Spirolox Retaining Rings in a toggle-joint (right) and a friction clutch (left). Installed externally or internally, there's bearing surface all around . . . Spirolox conforms to the groove perfectly to resist centrifugal forces to a higher degree, and resist thrust forces up to its shear strength. In fact, because of its unique two-turn coil design, Spirolox will not jump the groove. Spirolox *stays put* because opening and closing force is resisted by friction created between the two turns. In operation, they are actually "squeezed" together to form a "friction lock!"

In addition to its remarkable stay-put characteristics, Spirolox Retaining Rings provide many advancements which every manufacturer wants. They make machines simpler, lighter, more compact. They eliminate costly machining as well as such old-fashioned fastening methods as keys, pins and collars. They spiral into their grooves easily, saving time and labor in manual installation. They adapt readily to fixtures for automatic production line installation. They provide a uniform shoulder, without gaps or breaks to interrupt a uniform circumference . . . without lugs or projections to create weak spots. These retaining rings stay put, yet they come out again at the flip of a screw driver, ready for re-use . . . a great advantage when assemblies are serviced in the user's hands.

FREE SPIROLOX SPECIFICATIONS CATALOG may help you build a product of greater simplicity and greater sales appeal, by eliminating awkward features and trouble spots. Your copy is waiting to point out how your retaining applications can be handled surer, quicker, more economically with SPIROLOX! Address request for your complimentary Spirolox Specifications Catalog to **Thompson Products, Inc., Piston Ring Division (Ramsey Corporation) Dept. H, St. Louis 8, Mo.**

Spirolox Retaining Rings are covered by United States Patent No. 2,450,425 and Foreign Patents. Other patents pending.

R-5650RT

the better way

SpiralOlox RETAINING RINGS

to hold moving parts TOGETHER!

Write for Samples

gapless • concentric • requires no special tools • easy-in, easy-out • re-usable • stays put

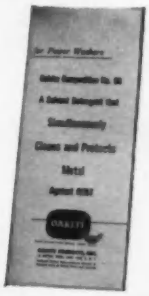
These Oakite shortcuts speed your metal cleaning

1 **Cleaning and rustproofing**—*in one washing operation*

Oakite Composition No. 98 (used cold or hot in one-stage or two-stage washing machines) removes cutting oils and chips—while it leaves a thin film that protects steel against rusting between operations or during temporary storage.

Excellent for cleaning before inspection: the metal is cool for immediate handling and the film (too thin to affect measurements) prevents finger prints from corroding highly finished surfaces.

One auto manufacturer uses No. 98 in seven plants for cleaning and rustproofing brake cylinders, camshafts, connecting rods, crankshafts, cylinder heads, flywheels, push rods, tappets, wrist pins, etc.



2 **Stripping pigmented paints**—*with no need for pickling before repainting*

Oakite Rustripper saves money in paint shops by doing a complete stripping job in one operation. It eliminates extra pickling and neutralizing to remove the metallic pigments, phosphate coatings and rust that prevent successful repainting.

A television manufacturer says "We formerly took 25 minutes to strip rejected cabinets, then had to pickle to remove tarnished phosphate coatings. Today 10 minutes in Rustripper strips the same cabinet so bright and clean you can't tell it from new. Eliminates pickle, neutralize and rinses."

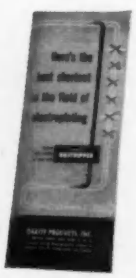
An auto parts maker uses Rustripper for continuous conveyor line stripping. "Cycle of 1 minute and 50 seconds works like a charm stripping paint and incidental rust from rejects and hooks."

3 **Cleaning, derusting and descaling**—*in one alkaline tank*

Oakite Rustripper saves money in plating shops by removing rust or heat scale at the same time it removes oil and other soils. Alkaline pickling with Rustripper avoids hydrogen embrittlement, etching of machined surfaces and other disadvantages of acid pickling. Rustripper is also used for precleaning or electrocleaning in plating lines.

An aircraft manufacturer who formerly sand blasted to remove heat scale says "Now the scale is removed in 30 minutes in a boiling soak in Rustripper."

A job plater who adds Rustripper to his reverse-current cleaner in an automatic plating machine, says "We used to clean 45 seconds. Now 20 seconds cleans sparkling bright . . . saves precious time . . ."



FREE Write for booklets

OAKITE PRODUCTS, INC., 28A Rector St., New York 6, N. Y.

Send me the FREE booklets indicated below:

1 "For Power Washers—Oakite Composition No. 98"
2 "Here's the best shortcut in the field of organic finishing"
3 "Here's the best shortcut in the field of electroplating"

NAME_____

COMPANY_____

ADDRESS_____

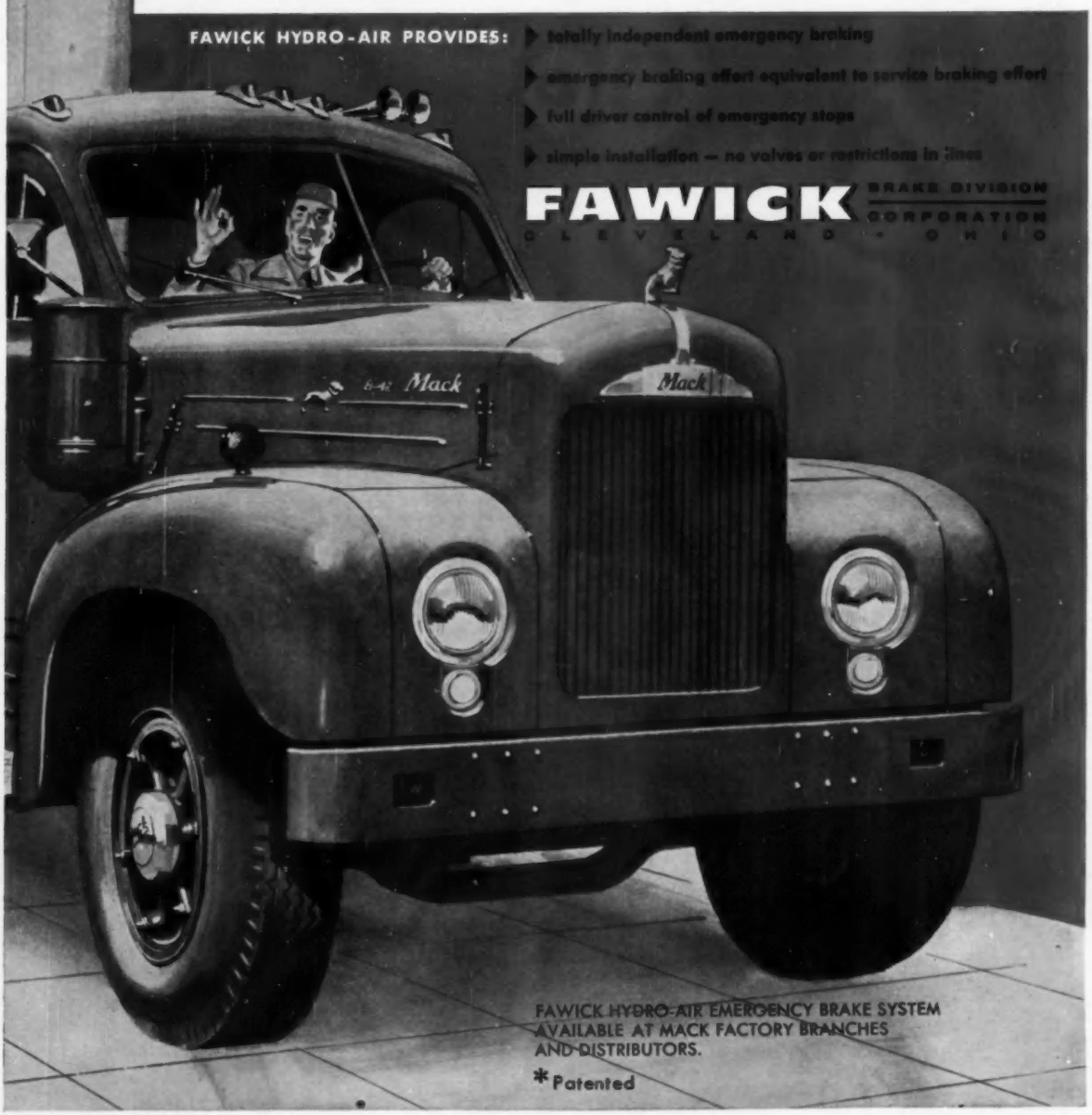
Technical Service Representatives in Principal Cities of U. S. and Canada

Export Division
Cable Address: Oakite

OAKITE

now available thru Mack ....
FAWICK Hydro-Air Emergency Brake System*

Mack, the "first name for trucks", is well known for specifying only the best and safest equipment. In line with this policy, Mack has recently made the Fawick Hydro-Air Emergency Brake System available for local installation through its Factory Branches and Distributors.



CAKE MIX IN A "JIFFY" WITH

CYPAK

Controlling automatic storage conveyors at Chelsea's modern food plant

Chelsea Milling Company, maker of well-known "Jiffy" brand premixed foods, uses flexible CYPAK* static control to reduce material handling costs in their plant at Chelsea, Michigan.

CYPAK begins at the mixing and packaging machines, memorizing the sequence of cartons going to the warehouse. Cartons are identified automatically, and then CYPAK directs storage according to the preselected pattern.

Subsequent delivery of cartons from storage to dock is also completely predetermined, making the warehousing operation totally automatic. An additional benefit realized by Chelsea with this system has been great reduction in carton breakage.

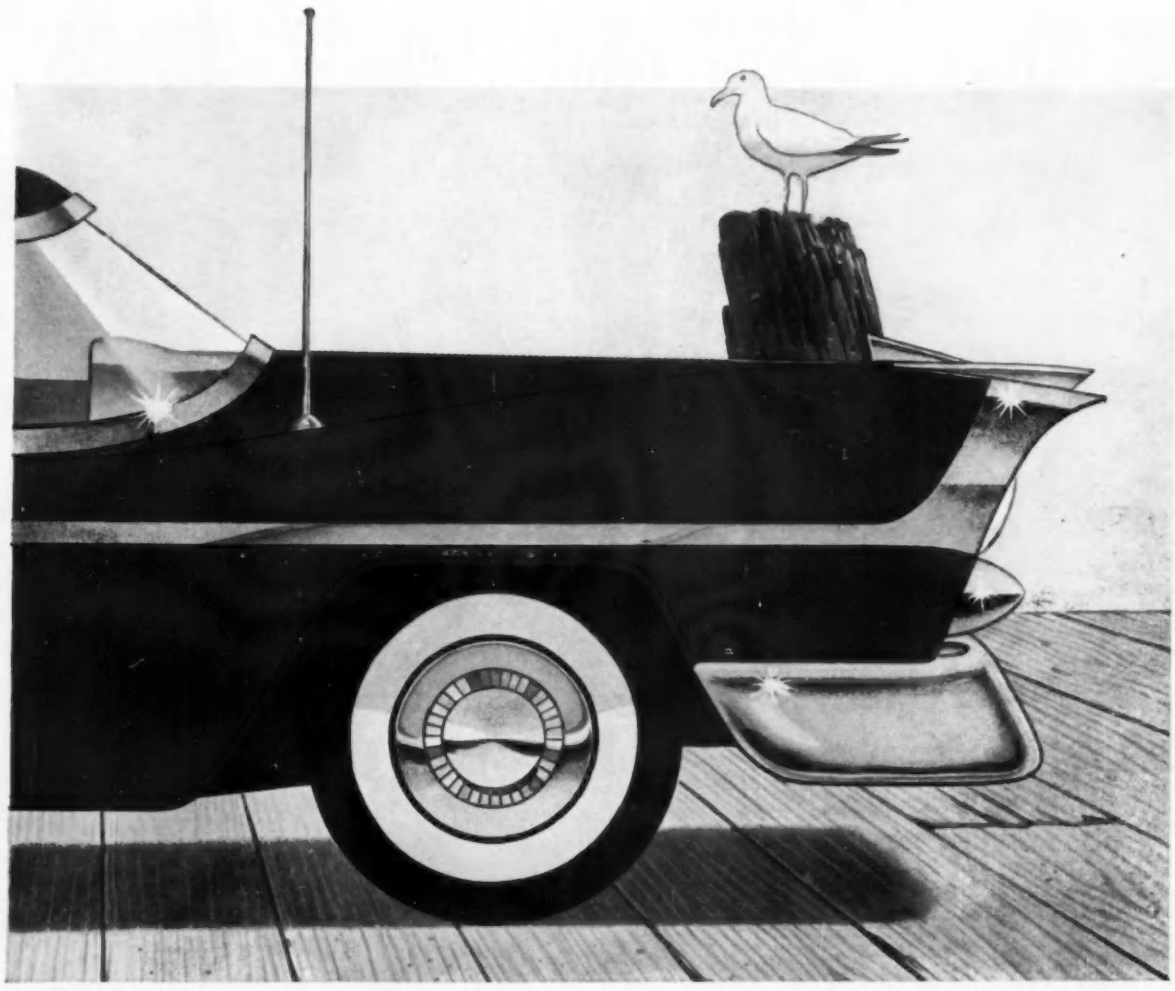
For complete information on CYPAK, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

*Trade Mark
J-22033

YOU CAN BE SURE...IF IT'S

Westinghouse

Mr. Lester L. Bosch, Partner, Bosch & La Tour views their system design.



The beauty of Crucible stainless steel is its high strength and lustre

How do you get unlimited flexibility in designing tomorrow's body and parts? You need a metal with beauty, strength, rigidity, lightness and superior resistance to corrosion. You need stainless steel.

Already, roof panels and radiators are being made with this versatile metal. Tomorrow, you may even design stainless steel posts and pillars, chassis frames, floor and roof deck panels. There may even be ceramic coatings for stainless that will provide dramatic new textural and tonal combinations.

Specify *Crucible sheet and strip* when you order stainless steel. Crucible promptly supplies standard grades and finishes in practically any width and thickness. And if design or fabrication problems arise, Crucible engineers and research teams will cooperate with you in every way.

Free Stainless Steel Selector contains complete data: nominal composition of all grades • physical properties • resistance to corrosion, scaling • data on machining, welding, hardening. Write: Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

Leakproof Bundyweld Tubing feeds

This double exposure shows how a driver can raise or lower the Citroën body at will, when traveling rutted roads or when changing tires. In normal operation, height-corrector valves automatically maintain proper road clearance, regardless of load. The system provides independent suspension for each wheel; depends on leakproof Bundyweld Tubing to carry its hydraulic fluid without failure.

BUNDYWELD IS DOUBLE-WALLED FROM A SINGLE STRIP

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

← **NOTE** the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

Citroën's hydro-pneumatic suspension*

Transmission, clutch, brakes, and steering also served by centralized hydraulic system through reliable Bundyweld

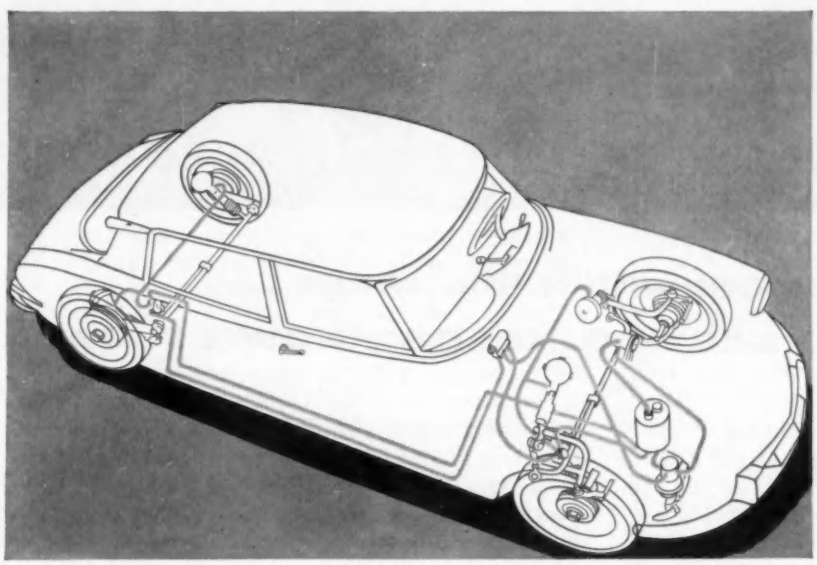
Fabulous is the word for Citroën's unique hydro-pneumatic suspension. It utilizes a combination of oil and inert gas under pressure to soak up every last jolt and jar for a cloud-soft ride. But Citroën's suspension and other power-assisted components need an unending supply of hydraulic fluid. And this is delivered unfailingly through Bundyweld Tubing®.

Ultrareliable is the word for Bundyweld Tubing. Because it is the only tubing double-walled from a single steel strip, then metallurgically bonded through 360° of wall contact, Bundyweld is amazingly strong and resistant to vibration fatigue . . . *leakproof by test.*

This same exclusive process gives Bundyweld high bursting strength and tensile strength . . . makes it smooth, ductile and easy to fabricate, even in the most complex shapes. These properties are the reasons *Bundyweld is used on 95% of today's cars, in an average of 20 applications each!*

Whether you want tubing straight, coiled, or fabricated precisely to specification, Bundy® will handle the job. Your tubing will be packaged carefully, delivered right on schedule—clean, bright and ready to use. And Bundy offers free, expert engineering service as well. Need tubing for mechanical or fluid transmission applications on cars, trucks, or farm equipment? Chances are you'll save time and money by checking first with Bundy. Call, write, or wire us today!

BUNDY TUBING COMPANY • DETROIT 14, MICHIGAN



Heart of Citroën's centralized hydraulic system is a high-pressure, 7-piston pump which drives hydraulic fluid into a constant-pressure accumulator. From there, it feeds through dependable Bundyweld Tubing to the suspension, shown in schematic diagram at left. Other power-assisted components: *Clutch* — standard-type automatically disengages when gearshift is moved, or engine rpm's fall to idling. *Transmission* — manual shift actuates hydraulic-assisted selector forks. *Brakes* — two separate Bundyweld lines supply front disc brakes and rear drum brakes. *Steering* — hydraulic cylinder moves standard rack and pinion either way on demand.

*Citromatic®

BUNDYWELD® TUBING

Bundy Tubing Distributors and Representatives: ***Bala-Cynwyd, Pa.:*** Rutan & Co., 1 Bala Ave. • ***Cambridge 42, Mass.:*** Austin-Hastings Co., Inc., 226 Binney St. • ***Chattanooga 2, Tenn.:*** Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • ***Chicago 32, Ill.:*** Lapham-Hickey Co., 3333 W. 47th Place • ***Dallas, Texas:*** Vinson Steel & Aluminum Co., 4606 Singleton Blvd. ***Los Angeles 22, Calif.:*** Pacific Metals Co., Ltd., 2187 S. Garfield • ***San Francisco 10, Calif.:*** Pacific Metals Co., Ltd., 3100 19th St. • ***Seattle 4, Wash.:*** • Eagle Metals Co., 4755 First Ave., South.

Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING • AFFILIATED PLANTS IN AUSTRALIA, ENGLAND, FRANCE, GERMANY, AND ITALY

Spring steel within this range...

FOR THE MOST EXACTING NEEDS KNOWN TODAY!

• That this is the age of specialization is certainly true in the use of steels. And in this regard *Athenia Steel* customers benefit especially by two not-too-common factors. First, by extreme control of quality and uniformity, unsurpassed, seldom equalled *anywhere!* Secondly, by painstaking technical service to determine or develop precisely the right steel for any special need.

Here at Athenia we concentrate on cold rolled high carbon flat steels, custom made of .45 carbon and higher, in widths from .015" to 16" and thicknesses from .001" to .065". Full range of finishes and tempers. We also produce special narrow width stainless, and the new super-tough, corrosion resistant spring material, Nilcor*.

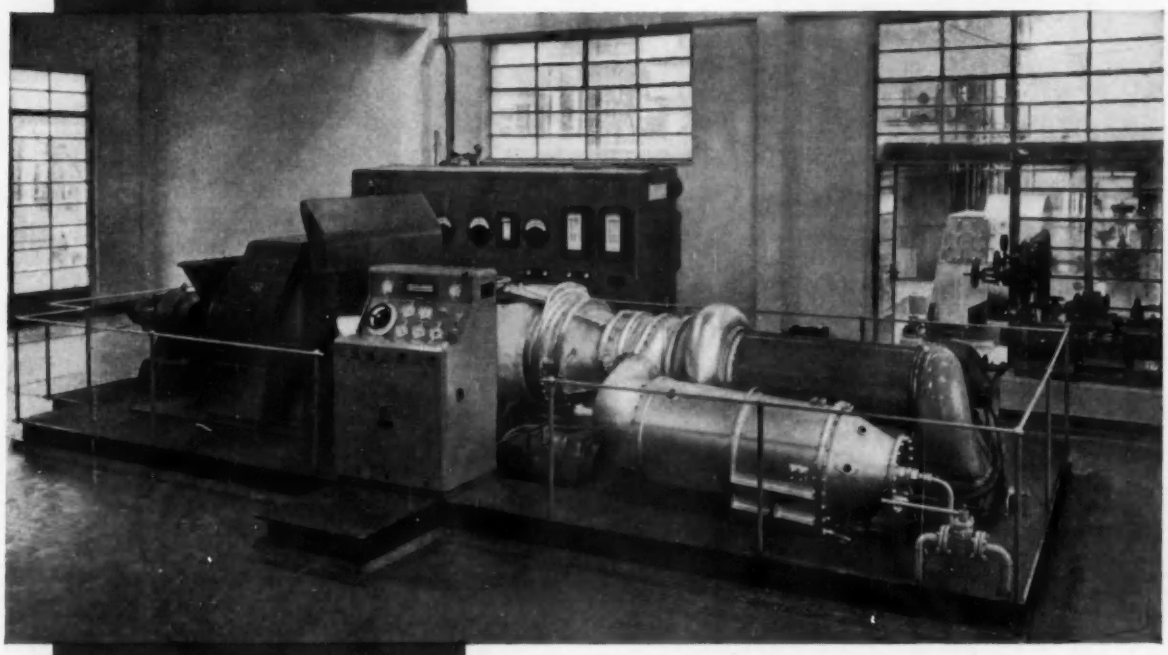
For a new and profitable experience in service and in steel controlled precisely to *your* needs... try us!

*Trade Mark National-Standard Company

NATIONAL NS NATIONAL-STANDARD **STANDARD**

DIVISIONS: NATIONAL-STANDARD, Niles, Mich.; *tire wire, stainless, music spring and plated wires* • WORCESTER WIRE WORKS, Worcester, Mass.; *high and low carbon specialty wires*
WAGNER LITHO MACHINERY, Secaucus, N. J.; *metal decorating equipment* • ATHENIA STEEL, Clifton, N. J.; *flat, high carbon spring steels* • REYNOLDS WIRE, Dixon, Ill.; *industrial wire cloth*

NOW for the first time...



The Mark TA gas turbine generating power and process steam in a refining application.

all power services in one package

In applications where multiple power services are required such as power generation, compressing, pumping, space heating, refrigeration, air conditioning, drying, or evaporating, the Clark Mark TA gas turbine is the economical choice.

Exhaust gases from this 1,150 bhp. gas turbine contain up to 10,000,000 BTU/H of recoverable energy at a temperature of 870°F. While these gases contain some products of combustion, 90% of the original oxygen content is still present.

The exhaust gases are useful where preheated air is desirable for combustion or supercharging purposes, for drying applications, catalyst regeneration, feedwater heating, evaporation of sea water, etc. These gases can also be used in air to air heat exchangers for space heating or to generate up to 9,500 pounds of low pressure steam per hour for process use. If even higher temperature gases are required, the Mark TA can be used solely as a power gas generator to provide gases of 1020°F at 20-22 psia. and a mass flow of 20 pounds per second.

For large stores, auditoriums, hotels, hospitals and office buildings, the Mark TA can provide approximately 1800 tons of air conditioning or refrigeration in the summer using the absorption cycle and also provide steam for heating in the winter. In all applications except power gas generating, this modern gas turbine also supplies 1,150 bhp. of rotative energy for pump, generator, or compressor drive.

Clark engineers stand ready to assist you in applying the Mark TA gas turbine to your application. Larger units with ratings of 9,500 bhp. are also available from Clark. Write for Bulletin No. 142.

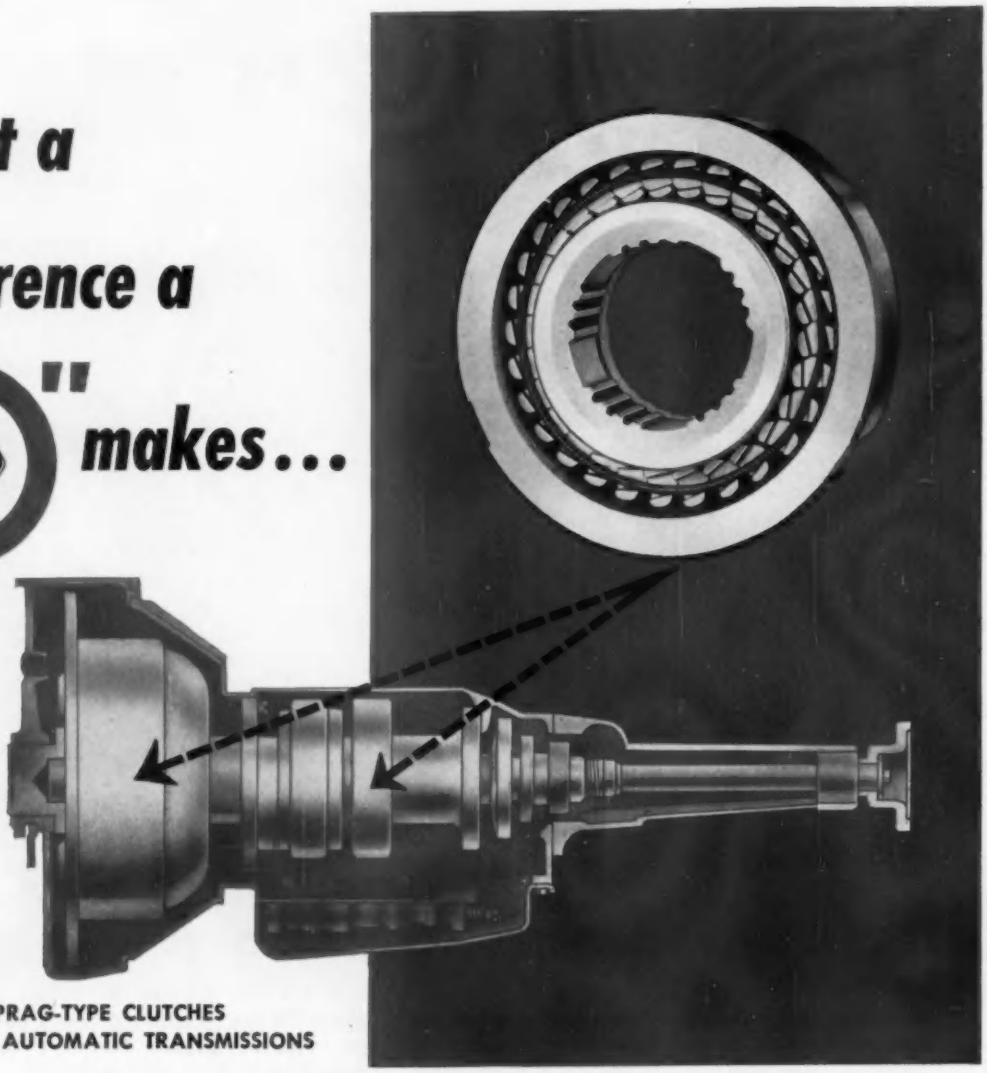
CLARK BROS. CO., OLEAN, N.Y.
One of the Dresser Industries
Offices in Principal Cities Throughout the World

Clark Bros. Co. is licensed to manufacture the Mark TA gas turbine in this country by Ruston-Hornsby, Ltd., Lincoln, England.

CLARK

WAGNER LITHO MACHINERY, Secaucus, N. J.: *metal decorating equipment* • ATHENIA STEEL, Clifton, N. J.: *flat, high carbon spring steels* • REYNOLDS WIRE, Dixon, Ill.: *industrial wire cloth*

What a difference a "D" makes...



IN SPRAG-TYPE CLUTCHES FOR AUTOMATIC TRANSMISSIONS

Automotive design demands component parts be stronger, lighter and smaller. Terms such as high capacity—less space—lightweight are familiar to automotive engineers and designers. These requisites are met by Formsprag for all automotive over-running clutch applications. With the Formsprag patented D-shaped sprag, a full complement of sprags may be used resulting in "higher capacity", "less weight" and "less space" than with any other type of over-running clutch.

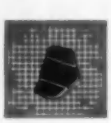
In addition, D-shaped sprags are self-spacing, act independently and share the load equally. Moreover they allow insertion of a *full complement* of sprags in far less space. So, more engine torque can be transmitted per cubic inch of clutch displacement with Formsprag than by any other type of over-running clutch.

Formsprag's basically simple design permits economical prototype manufacture.

Automotive and aircraft manufacturers who demand the ultimate in over-running clutches specify Formsprag. Why not see for yourself what a difference a D makes. Next time you have a clutch application—specify Formsprag—world's largest exclusive manufacturer of over-running clutches.

FORMSPRAG COMPANY

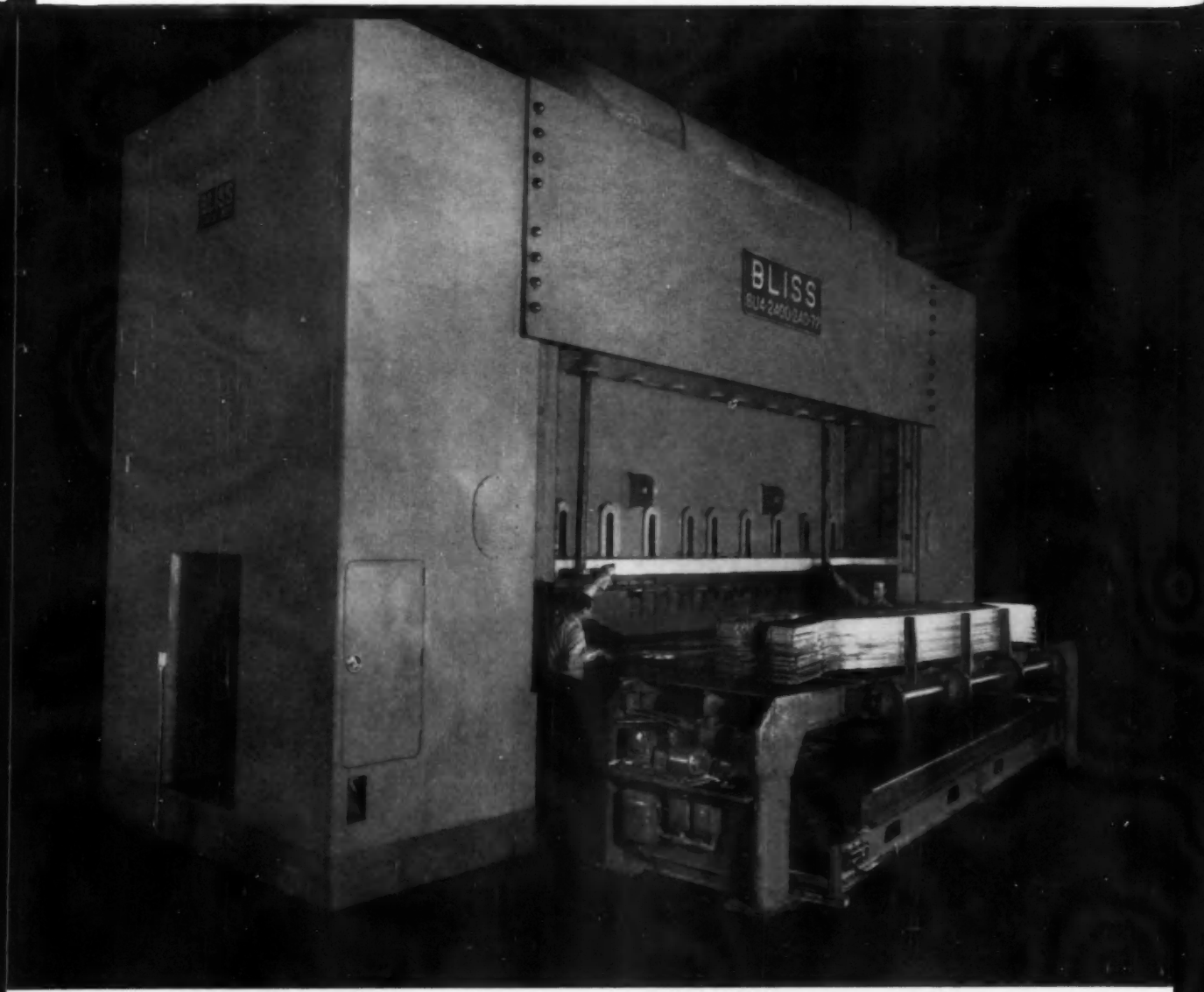
VISIT BOOTH 208
Design Engineering Show
May 20-23



23583 HOOVER ROAD, VAN DYKE (DETROIT) MICHIGAN

The only clutch that can give you full-complement performance.

A-13-5C



LOW, WIDE and HANDSOME

. . . it's the largest of its kind in the world

This is the largest mechanical underdrive press in the world. It is 40 feet long, 20 feet above floor level, 22 feet below, and has a capacity of 2400 tons.

And what a job it does! At the Reading, Pa., plant of Parish Pressed Steel Company, it stamps out 20-foot-long auto chassis side rails from thick hot-rolled steel blanks... two per stroke, sixteen per minute. Or, by using the cushion between the openings in the uprights, it produces 30-foot-long truck chassis rails.

Like Parish, many a firm is shifting to underdrives wherever it can. Their low silhouette fits into one-story plants. And with the entire drive "down under"—below the working floor — maintenance becomes simpler and faster. It's the modern press for the modern plant. In other words, it's Bliss.

BLISS
SINCE 1857

100 years of making metal work for mankind

E. W. BLISS, COMPANY, Executive Offices, Canton, Ohio

Presses • Rolling Mills • Mill Rolls • Can Machinery • Die Sets • Ordnance

If you're an **engineer** whose

future is being held up...

TAKE A LOOK AT THE FUTURE

YOU CAN ENJOY RIGHT NOW

AS A DOUGLAS ENGINEER!

It's important that you use your *full* talents *now*... if you are to expand in your job. This requires assignments of the scope you will find at Douglas... assignments that allow you to accomplish more and gain rich rewards. Many opportunities exist for career-minded engineers in modern Douglas plants and testing facilities across the nation. For example...

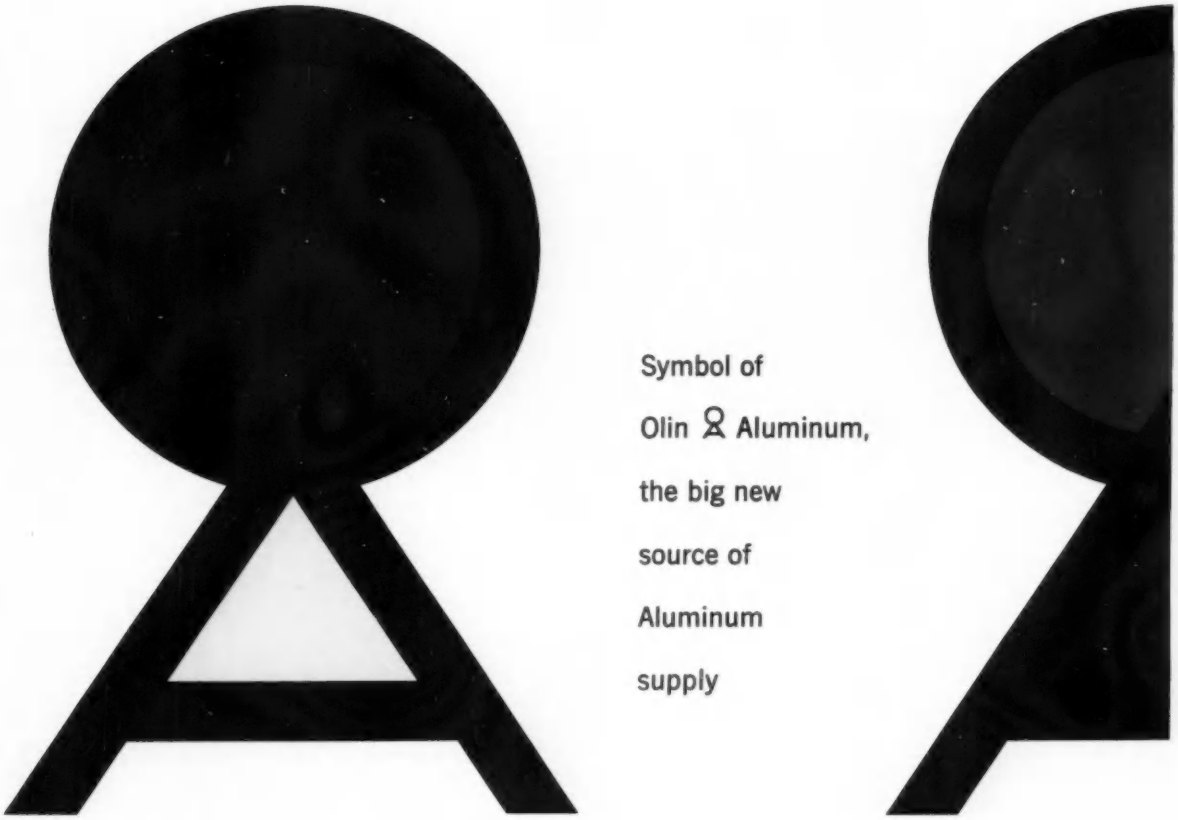
STRESS ANALYSTS ARE NEEDED NOW! Aeronautical, Civil and Mechanical Engineers work on structural strength assignments from design stages through static, dynamic and wind tunnel testing.

For important career opportunities in your field, write:

C. C. LaVENE
DOUGLAS AIRCRAFT COMPANY, BOX C-620
SANTA MONICA, CALIFORNIA

Go further with **DOUGLAS**

FIRST IN AVIATION



Symbol of
Olin Aluminum,
the big new
source of
Aluminum
supply

OLIN ALUMINUM brings you an important new concept of

Quality and Service designed to cut your manufacturing costs

Olin Aluminum is already being produced at four locations. Soon, backed by a multi-million dollar investment and the extensive experience of Olin Mathieson Chemical Corporation in the non-ferrous metals field—Olin Aluminum's new, ultra-modern facilities will be ready to produce an initial annual volume of more than 240 million pounds of fine Aluminum.

The full integration of these new facilities—complete from ore ships to Alumina Plant, Reduction Plant, Rolling Mills and Extrusion Plants—will assure dependable delivery of Olin Aluminum to you. And the advanced technology and design of these facilities plus the experienced skill of the men who will operate them will mean competitively superior metallurgical quality, tolerances and finish for every user of Olin Aluminum.

That is Olin Aluminum's new concept of Quality and Service: fine Custom-Made Aluminum so tailored to your individual needs that it will save you manufacturing operations...delivery and service so dependable that costly delays will be eliminated...and technical assistance so thorough and imaginative that it will assure you maximum economic use of every ounce of Aluminum.

The men from Olin Aluminum are already making calls on industry. Soon they will be coming your way. Meanwhile, we cordially invite your inquiries. Write to: Aluminum Division-Sales, Olin Mathieson Chemical Corporation, 460 Park Avenue, New York, 22, N. Y.

OLIN ALUMINUM

AND "OLIN ALUMINUM" ARE TRADEMARKS. COPYRIGHT 1957, OLIN MATHIESON CHEMICAL CORPORATION

this ERIE press speeds extrusion

Presses like this—made expressly to extrude graphite electrodes—are routine specialization for Erie Foundry Company. This 450-ton press is now performing in the field, in typical trouble-free Erie fashion, providing faster extrusion work. The bed plate, rigidly attached to the press, eliminates the need for lining-up at our customer's plant, and assures continued accurate alignment. Die changes can be made in a matter of minutes by removing the clamp nuts and separating the half clamps by cranking.

Smoother Tamping Action

The operator controls the action of this Erie press smoothly and accurately by moving a hand lever in the same direction the ram travels. The further the lever is moved from vertical, the faster the ram travels . . . no other control valves are required. Fast advance and reverse speeds are achieved by auxiliary cylinders.

A similar carbon extrusion press rated at 2000 tons is now being assembled in the Erie Foundry Company plant. We invite you to see this press.

Erie Foundry Company would like to quote on your requirements. Please write

Hydraulic Press Division

ERIE FOUNDRY CO. ERIE 5, PA.

World's greatest name in forging machines and hydraulic presses since 1895

How Aeroquip Flexible Hose Lines Simplify Fluid System Design and Installation

TYPICAL AEROQUIP HOSE TYPES AVAILABLE

Aeroquip 1503 and 1502 Single Wire Braid Hose and Reusable Fittings are recommended for medium pressure hydraulic, lube and fuel oil, water and air lines up to 3000 psi. Sizes from 3/16" to 3".

Aeroquip 1509 Double Wire Braid Hose and Reusable Fittings are recommended for high pressure hydraulic, grease, fuel and air lines up to 4500 psi. In sizes from 1/4" to 2".

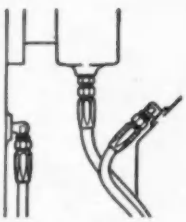
Aeroquip 2802 Teflon Hose and Reusable "*super gem*" Fittings are recommended for chemical, steam, hot asphalt and other corrosive fluid lines. In sizes from 1/4" to 1 .

Aeroquip 1525 Cotton Braid Hose and *SOCKETLESS** Fittings are recommended for oil, fuel, air and water lines on engines and other applications up to 250 psi. In sizes from 1/4" to 3/4". *(Patent Applied For).

Write for full information

SOCKETLESS and "*super gem*" are Aeroquip Trademarks

More simplified and compact fluid system designs can be achieved in many cases through proper application of flexible hose lines. The basic design advantage lies in the fact fewer "parts" are required. A single flexible hose line can be used where elbows, formed tubing sections and assorted adapters are needed using rigid tubing or piping. Flexible hose lines also offer great advantage on fluid systems subject to flexing, vibration and stress.



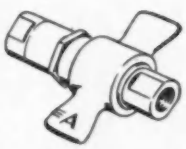
A wide variety of hose types is available to the designer. Aeroquip, for example, now produces 55 different hose types. Some have been developed primarily to carry special fluids. Others have been developed to withstand constant flexing, vibration, surge pressures, extreme temperatures.

REUSABLE HOSE FITTINGS

Aeroquip Hose Lines are unique in that every Aeroquip Fitting is detachable and reusable. In designing fluid systems, reusable fittings offer two advantages. First, mock-ups can be made and modified easily using hand tools to make up hose assemblies. Second, hose assemblies can be quickly made up in production quantities from bulk hose and reusable fittings without installation of expensive swaging machines in a manufacturer's plant. This benefit is also passed on to the equipment purchaser when replacement hose lines are needed. A small supply of bulk hose and a few spare fittings can be used to make quick replacements in the field. Aeroquip maintains an extensive network of distributors to serve users of Aeroquip Hose Lines.

SELF-SEALING COUPLINGS

Where fluid lines or systems require connection and disconnection for periodic inspection or maintenance, Self-Sealing Couplings can simplify design. Replacing two shut-off valves, a Self-Sealing Coupling permits disconnection of lines under pressure without loss of fluid or inclusion of air into the system. Aeroquip manufactures six types of Self-Sealing Couplings, for general industrial use, aircraft systems, Freon systems, LP-Gas fuel tanks, railroad diesel fueling and farm implement hydraulic systems.



FREE ROUTING AND INSTALLATION GUIDE

To help in planning and installing flexible hose lines, Aeroquip has prepared a handy 16-page guide covering flexible applications, bend radii, routing to avoid abrasion, heat damage, flexing failures, etc. Write for your copy today. See our catalog pages in Sweet's Product Design File, Section 6d.

Complete engineering assistance is available to manufacturers.

Aeroquip Corporation,
Jackson, Michigan
Please send_____copies of "Guide for Routing and Installation of Aeroquip Flexible Hose Assemblies."

Name_____

Title_____

Company_____

City_____ Zone____ State_____

Visit Aeroquip Booths 727-729 (2nd floor), Design Engineering Show, May 20-23, New York

Aeroquip

REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

IN CANADA: AEROQUIP (CANADA) LTD., TORONTO 10, ONTARIO

SOCKETLESS Fitting Patents: Argentina, Australia, Austria, France, Great Britain, Italy, Mexico, South Africa, Spain—Patents pending in U.S.A., Canada, and other countries.
LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

YOUR CAR'S "FOUL WEATHER FRIEND!"

What did winter weather do to *your* car? If the "brightwork" isn't stainless steel, chances are it took its toll in pitting and dents from salted and cindered roads – and corrosion from heavy winter moisture.

Stainless steel is the ounce of prevention – and the pound of beauty – that eliminates all this. For nothing stands up to bad weather like stainless. In foul weather or fair, it's the metal that comes up bright and shining with mere soap-and-water washing. Road chemicals don't change its solid, gleaming characteristics. It even resists denting.

That's why stainless means so much more than showroom beauty. Car buyers know that stainless steel – in trim and in critical parts – stays useful and attractive for the *life of the car*. Stainless keeps *re-sale* values up, too.

Investigate the benefits and economies of stainless steel in automotive uses. You'll learn that the finest stainless steels are made with Vancoram Ferro Alloys. Your steel supplier can give you valuable facts about how enduring stainless steel can mean added value and beauty in the automobiles you make – and use.

VANCORAM

VANADIUM CORPORATION OF AMERICA

420 Lexington Avenue, New York 17, N. Y. • Chicago • Cleveland • Detroit • Pittsburgh

Producers of alloys, metals and chemicals

TDA® BRAKES

where you have equipment to control or stop...

NEW TIMKEN® DLM BRAKE

offers Versatility... Flexibility... Dependability!

The revolutionary DLM brake will serve effectively with a variety of equipment. It has already proved its value as a control or parking brake, and is used in various sizes on trucks, busses, machinery, farm equipment, cranes, shovels, hoists, golf buggies, lift trucks.

Highly Efficient! The DLM brake is basically a self-energizing two-shoe brake in which both shoes do the same amount of work—give equal forward and reverse torque output, regardless of drum rotation.

Simpler! Only 8 parts, with interchangeable shoes and springs. Lubrication is not required. No internal adjustment necessary. Enclosed design guards against entrance of foreign matter and requires only a minimum of maintenance.

Lighter! More Payload Advantages! Improved TDA design using lightweight fabricated steel shoes and brake supports saves many pounds over heavier, more costly brakes.

©1956, RS&A Company

For every industrial, agricultural or automotive application where braking is required!

TIMKEN Detroit BRAKES

ROCKWELL SPRING AND AXLE COMPANY

TDA Plants at: Detroit, Michigan • Oshkosh, Wisconsin • Utica, New York
Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania

Timken-Detroit Brake Division
Rockwell Spring & Axle Company
Dept. AI-57, Ashtabula, Ohio

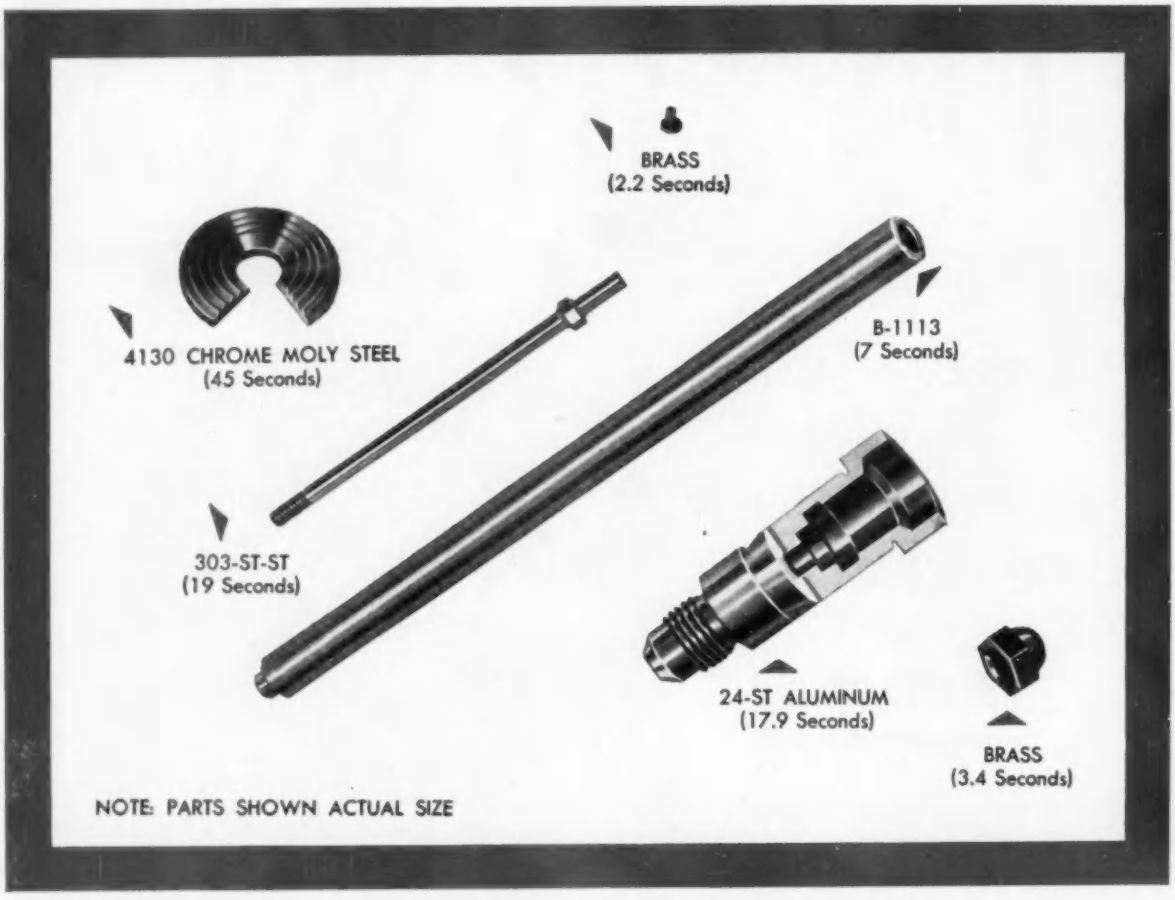
Please send me further information on your "DLM" Brake.

Name ..... POSITION

Company .....

Address .....

City ..... State .....



Save Money On Parts Like These

DETROIT Screw Matic 750

SINGLE SPINDLE BAR AUTOMATIC

HERE'S HOW:

- 4 to 1 ratio reversing, transmission drive.
- Greater capacity with a 1¾″ stroke from a standard 6″ cam.
- Reversing clutches that need no adjustment.
- Cam shaft drive clutch with brake to prevent coasting.
- Anti-backlash cam shaft.
- Six spindle speeds in a cycle assuring correct cutting speeds for all tools.

Write for further information on various models available. We will, also, gladly make time cycle estimates for your parts.

A PRODUCT OF

THE GEAR GRINDING MACHINE COMPANY

3903 Christopher • Detroit 11, Michigan

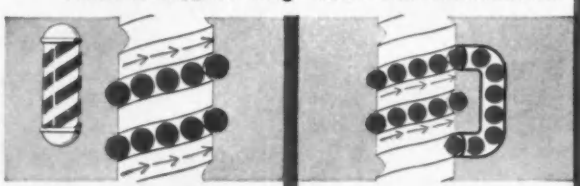
MANUFACTURERS OF: FULLY AUTOMATIC GEAR GRINDING MACHINES
RZEPPA (SHEPPA) CONSTANT VELOCITY UNIVERSAL JOINTS 57-3

ACTUATION PROBLEM too tough for ordinary devices?

SAGINAW CAN HELP YOU SOLVE IT!

Saginaw b/b Screws guaranteed 90% efficient —offer 6 major advantages for designers

Available in custom machined and commercial rolled thread types—have been built from 1½ inches to 39½ feet long—⅜ to 10 inches diameter.



Nut glides on steel balls. Like stripes on a barber pole, the balls travel toward end of nut through spiral "tunnel" formed by concave threads in both screw and mating nut.

At end of trip, one or more tubular guides lead balls diagonally back across outside of nut to starting point, forming closed circuit through which balls recirculate.

1 VITAL POWER SAVINGS. With guaranteed efficiency of 90%, Saginaw b/b Screws are up to 5 times as efficient as Acme screws, require only ⅕ as much torque. This permits much smaller motors with far less drain on the electrical system. Circuitry is greatly simplified.

2 SPACE/WEIGHT REDUCTION. Saginaw b/b Screws permit use of smaller motors and gear boxes; eliminate pumps, accumulators and piping required by hydraulics. In addition, Saginaw b/b Screws themselves are smaller and lighter. Units have been engineered from 1½ in. to 39½ ft. in length.

3 PRECISE POSITIONING. Machine-ground Saginaw b/b Screws offer a great advantage over hydraulics or pneumatics because a component can be positioned at a predetermined point with precision. Tolerances on position are held within .0006 in./ft. of travel.

4 TEMPERATURE TOLERANCE. Normal operating range is from −75° to +275° F., but assemblies have been designed in selected materials which function efficiently as high as +900° F. These units are practical where hydraulic fluids have lost efficiency or reached their flash point.

5 LUBRICATION LATITUDE. Even if lubrication fails or cannot originally be provided because of extreme temperatures or other problems, Saginaw b/b Screws will still operate with remarkable efficiency. Saginaw units have been designed, built and qualified for operation without any lubrication.

6 FAIL-SAFE PERFORMANCE. Far less vulnerable than hydraulics. In addition, Saginaw offers three significant advantages over other makes: (1) Gothic arch grooves eliminate dirt sensitivity, increase ball life; (2) yoke deflectors and (3) multiple circuits provide added assurance against operating failure.

YOUR FREE COPY OF THIS NEW b/b SCREW AND SPLINE "PROBLEM SOLVER" SHOWS HOW

36 pages crammed with time-, work-, and money-saving facts: Principles • Types • Basic Operations • Coupling Methods • Efficiency • Advantages • Selection Factors • Design Data • Sample Problems

SAGINAW b/b SPLINE

● Averages 40 times lower coefficient of friction than ordinary sliding splines!

Utilizing the same basic *gliding ball* principle, Saginaw has developed the *Saginaw b/b Spline* which radically increases the efficiency of transmitting or restraining high torque loads.

It can be fitted with integral gears, clutch dogs, bearing and sprocket seats, etc. Units have been built from 3 inches to 10 feet long—⅜ to 6 inches in diameter.

SEND TODAY FOR THIS FREE 1957 ENGINEERING DATA BOOK . . .

or see our section in Sweet's Product Design File

Visit Booth 122 at Design Engineering Show, May 20-23—New York City

Saginaw ball bearing Screws and Splines

SAGINAW STEERING GEAR DIVISION OF GENERAL MOTORS

WORLD'S LARGEST PRODUCER OF BALL BEARING SCREWS AND SPLINES

Saginaw Steering Gear Division
General Motors Corporation
b/b Screw and Spline Operation
Dept. 7AU, Saginaw, Michigan

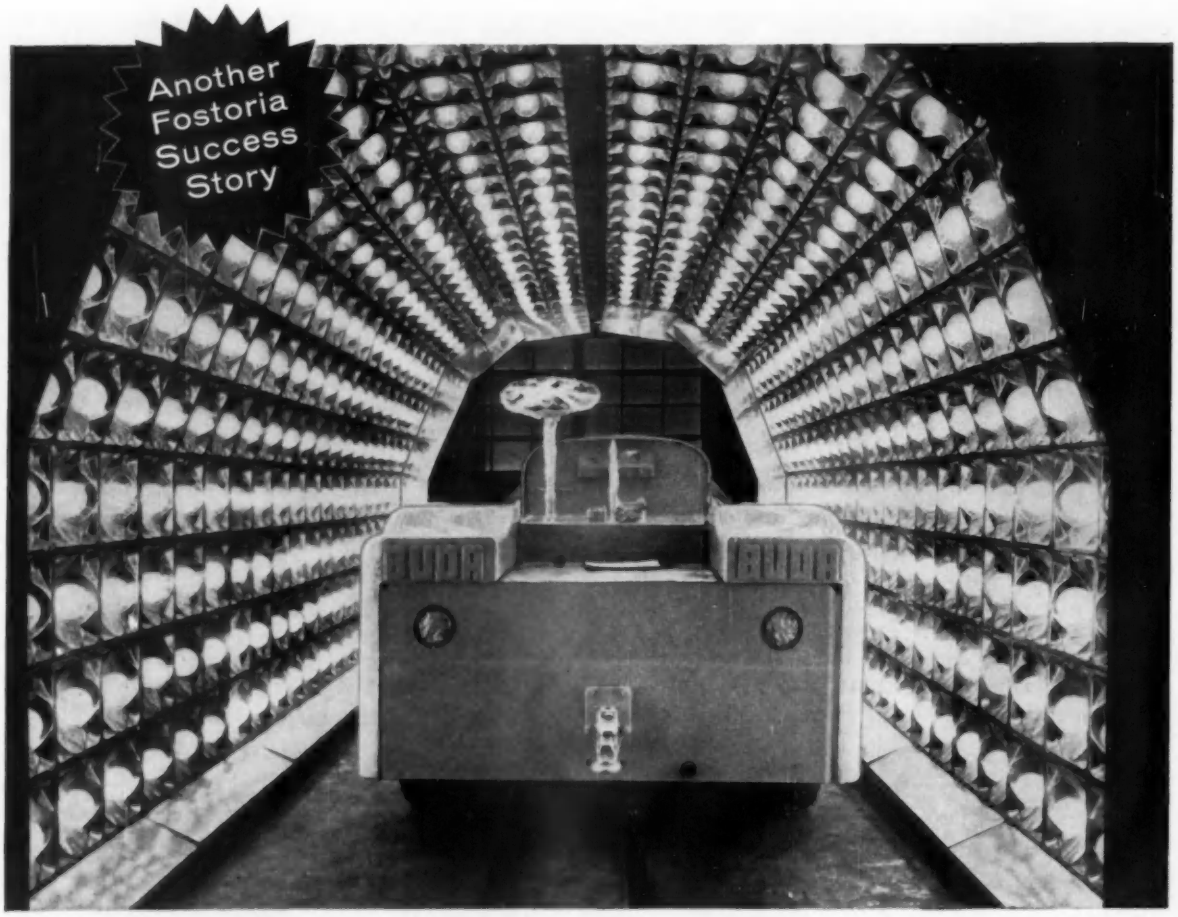
Please send new engineering data book on Saginaw b/b Screws and Splines to:

NAME_____

COMPANY_____ TITLE_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____



Infrared drying lets you drive this Allis Chalmers truck *10 minutes after you Spray!*

Until Fostoria engineers were called in by the Allis-Chalmers Buda Division at Harvey, Illinois, their newly painted lift trucks and tractors took from 8 to 48 hours to dry by air. Production flow was unsteady. Units piled up in drying area.

Now, fully equipped trucks minus only the seats—with gas tanks full—move through an 18-foot Fostoria infrared oven for a thorough paint-drying that takes *only 10 minutes!* Type G-30 infrared lamps in their Fostoria-engineered oven have a total connected load of 100 KW.

Fostoria's fast, uniform infrared heating has improved production astonishingly, Allis-Chalmers officials say, while maintaining their top quality finish. The radiant oven gets more work done at lower cost.

One of Fostoria's experienced sales engineers in your area will be glad to give you latest facts on our radiant equipment widely used for heating, degreasing, drying, baking and other industrial processing. He can also arrange a convincing demonstration in your plant if you are interested. See your directory or write us for his name.

Write for free 20-page book, "Radiant Heat—Applications Unlimited"

FOSTORIA PRESSED STEEL CORPORATION
Dept. 529, Fostoria, Ohio

INFRA-RED fostoria SYSTEM

5516

Pioneer manufacturer of radiant equipment—components and complete ovens

10,000 LBS. OF POWER

for even ordinary lubrication jobs!

FAST, EFFICIENT HEAVY-DUTY ALEMITE HAND GUNS

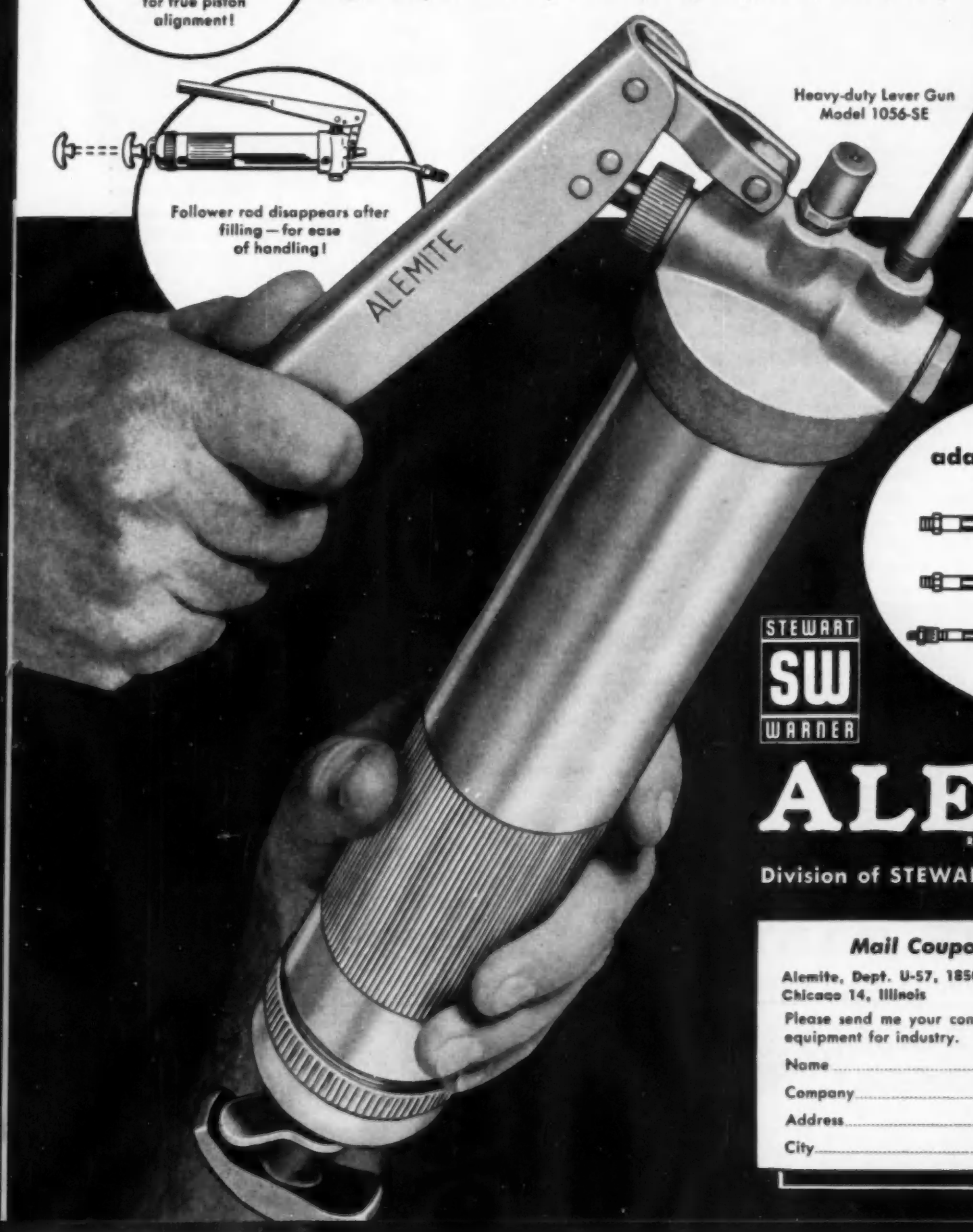
Linkage is heavy steel for true piston alignment!

This rugged Alemite lever-type gun is packed with power and superior features for super performance in industrial lubrication! Develops 10,000 lbs. pressure . . . more than enough for ordinary lubrication jobs—with plenty of reserve power for "tight" bearings! Handles all regular pressure gun greases. Long-operating handle for maximum leverage. Loader fitting permits fast, clean filling (or gun may be filled by suction). Capacity, 1 lb., outlet, ⅛" p.t.

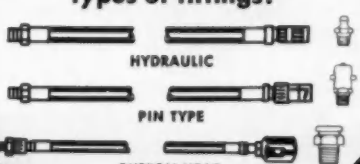
Follower rod disappears after filling—for ease of handling!

Heavy-duty Lever Gun Model 1056-SE

Loader fitting for fast clean filling with loader pump. No mess—no waste—no air pockets!



Complete line of adapters and hose for all types of fittings!



STEWART SW WARNER

ALEMITE

REG. U. S. PAT. OFF.

Division of STEWART-WARNER CORPORATION

Mail Coupon for FREE Catalog!

Alemite, Dept. U-57, 1850 Diversey Parkway
Chicago 14, Illinois

Please send me your complete catalog on Alemite lubrication equipment for industry.

Name .....

Company .....

Address .....

City ..... Zone ..... State .....

HOW MANY WAYS CAN *Special Purpose Fasteners* CUT COSTS FOR YOU?

How many of your products employ laborious, old-fashioned fastening methods where simple fasteners could do the job and cut costs, too? How many parts and sub-assemblies can be adapted to include a self-fastening feature? How many future products could be improved by advance planning for fastener efficiency?

United-Carr's engineering staff offers you a wealth of experience in the design of special-purpose fasteners and self-fastening devices. Large-scale manufacturing facilities (including in-plant plastics molding equipment) ensure economical, *volume* production and prompt deliveries. United-Carr field representatives are ready to call on you at *your* request.

POLYETHYLENE MOUNTING FOOT

No mar, no scratch glide for use on TV receivers, record changers, small appliances, etc. Assembles into round hole in wood or metal cabinets.

NYLON SNAP-IN NUT

Snaps into square hole stamped out of sheet metal . . . provides secure anchorage for any sheet metal or self-tapping screw . . . highly effective electrical insulator.

QUICKEY FASTENER

Eliminates need for welding or swaging studs to sheet metal stampings, facilitates nesting, eliminates damage in transit because Quickey snaps in before final assembly.

THREAD CUTTING FASTENER

Re-usable, self-locking, vibration-proof fastener cuts clean, deep threads on unthreaded chrome-plated studs. Available for ⅛", 5/16" and ¼" studs.

PLUG BUTTONS

Snap into ⅛" to 3" dia. holes. Can be embossed with ornamental or functional designs . . . various finishes, shapes and sizes.

FISHTAIL RATCHET PLATE

Holds on smooth, die-cast metal or plastic studs to anchor name plates, trade marks etc. on appliances, automobiles, electronic apparatus, etc.

TRIMOUNT STUDS

Hold two or more thicknesses of material together. Easily installed by hand. Insure vibration proof attachment. Permanent or removable. Many shapes and sizes.

V-LOCK TEENUT

Re-usable, self-locking, one-piece, all-metal nut has high tensile strength, is unaffected by heat or oils. In various shapes, sizes and metals.

SOL-A-NUT

Self-locking, rustless, heat resistant. Sturdy, one-piece stainless steel construction prevents corrosion if nicked or scratched.

DURABLE DOT FASTENER

Snap fastener for cloth, leather, plastics and other materials. Positive closure, instant release. Black, nickel or brass finish.

CARR FASTENER COMPANY

Division of United-Carr Fastener Corp., Cambridge 42, Massachusetts

MAKERS OF DOT FASTENERS

Address .....

City ..... Zone ..... State .....

You can't BUY it until we TRY it

Few engineers have had the pleasure of seeing a new design spring into production without bugs. Many have been wounded by bugs that survived exhaustive lab tests, and emerged in production quantities on the road. American Brakeblok's on-the-road fleet testing prevents this painful experience.

To insure complete design confirmation, pilot production samples are subjected to field service conditions in cars and trucks completely instrumented to furnish comprehensive test reports. In addition, American Brakeblok's nationwide field service engineering is available to assist in your own evaluations.

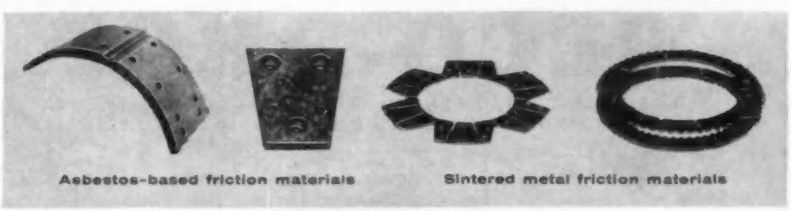
For a complete picture of American Brakeblok service, send for the 20-page brochure, "Taming Dynamics with Engineered Friction." Good reading.

Complete Test Data Confirms New Designs

Sample data pages prepared for customers from tests

Drums and linings inspected after each test run

American Brakeblok
REG. U. S. PAT. OFF.
FRICTION MATERIALS



Asbestos-based friction materials

Sintered metal friction materials

Brake Shoe COMPANY

AMERICAN BRAKEBLOK DIVISION
DETROIT 9, MICHIGAN

In 10 short years the Chambersburg CECO-DROP has become the standard gravity drop hammer of the forging industry. Some of the reasons for this astonishing success are these:

1. The Ceco-Drop is a proven tool, the original "Boardless Board Drop Hammer," with world wide acceptance.

2. More than 400 Ceco-Drops are in service in 119 forge shops all over the world. Many companies have initiated programs looking toward complete conversion to Ceco-Drops.

3. The Ceco-Drop has created new standards of performance, and established new standards of tolerance in drop forgings.

4. The Ceco-Drop minimizes leg fatigue in drop hammer operation. Hammermen prefer the Ceco-Drop.

5. The Ceco-Drop costs less to maintain, has fewer, more durable parts. Automatic lubrication prolongs parts life.

6. The Ceco-Drop is economical to operate. Air or steam is used only when the hammer is running.

7. The Ceco-Drop forges more minutes per hour. (Once it is set-up, just turn on the air or steam and forge.) It does more forging per blow, requires no board changes, no friction adjustment.

8. The Ceco-Drop is safer . . .The operator's station is clear. There are no overhead hazards. It has fewer, lighter mechanisms. It has a safety dog and safety cylinder cover. Power failure stops the hammer and clamps the ram.

9. The Ceco-Drop requires less die set-up time. Die changes are quicker, easier. It takes but a minute to adjust the stroke.

10. The Ceco-Drop has a wide range of operation due to the unique short stroke adjustment and control.

CECO-DROP

U. S. PATENT NO. 2,604,071, JULY, 1952 . . . OTHERS PENDING
CECO-DROPS HAVE BEEN BUILT IN SIZES FROM 500 LBS. TO 8000 LBS.

Builders of THE IMPACTER
"FORGING IN MID-AIR"

CHAMBERSBURG ENGINEERING CO. • CHAMBERSBURG, PENNA.

Flat Blanks to Finished Cylinders...

Higher Production Better Quality

one of the nation's foremost producers of cylinders for compressed gases

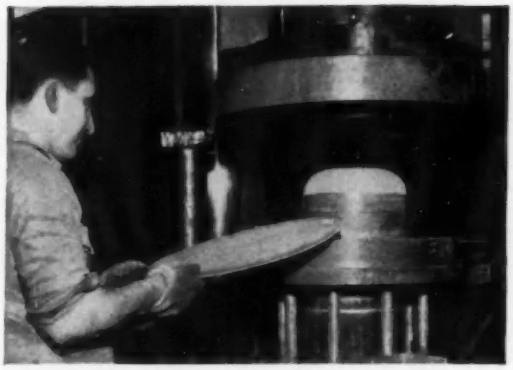
—NORRIS-THERMADOR CORP.—

uses Parker's aids to cold forming

The Bonderite and Bonderlube combination provides effective lubrication and acts as a non-metallic parting layer between work and dies. More severe deformations are possible, reducing the number of press operations and process anneals necessary. Die life is lengthened and surface finish improved.

Bonderite and Bonderlube, by more efficient lubrication, help plants reach new production levels, get more efficient and economical production, and achieve better, more uniform quality.

Parker's cold forming experience in many plants and on many products is available to apply on your cold forming problems at once. Write or call today.



Cupping: Flat CO_2 cylinder blank, treated with Bonderite and Bonderlube, is changed into cylindrical form, with maximum of about 45% reduction in diameter of blank.

First reduction: Diameter of cup is made smaller and length increased without major change in wall thickness.

Second reduction: Final diameter of part with respect to length determines number of reductions required. Photos courtesy NORRIS-THERMADOR Corporation, Los Angeles, California.

FREE TECHNICAL BULLETIN MAILED ON REQUEST

Illustrated technical bulletin "Bonderite and Bonderlube As Aids In Cold Forming" contains detailed information. Mailed free on letterhead request.

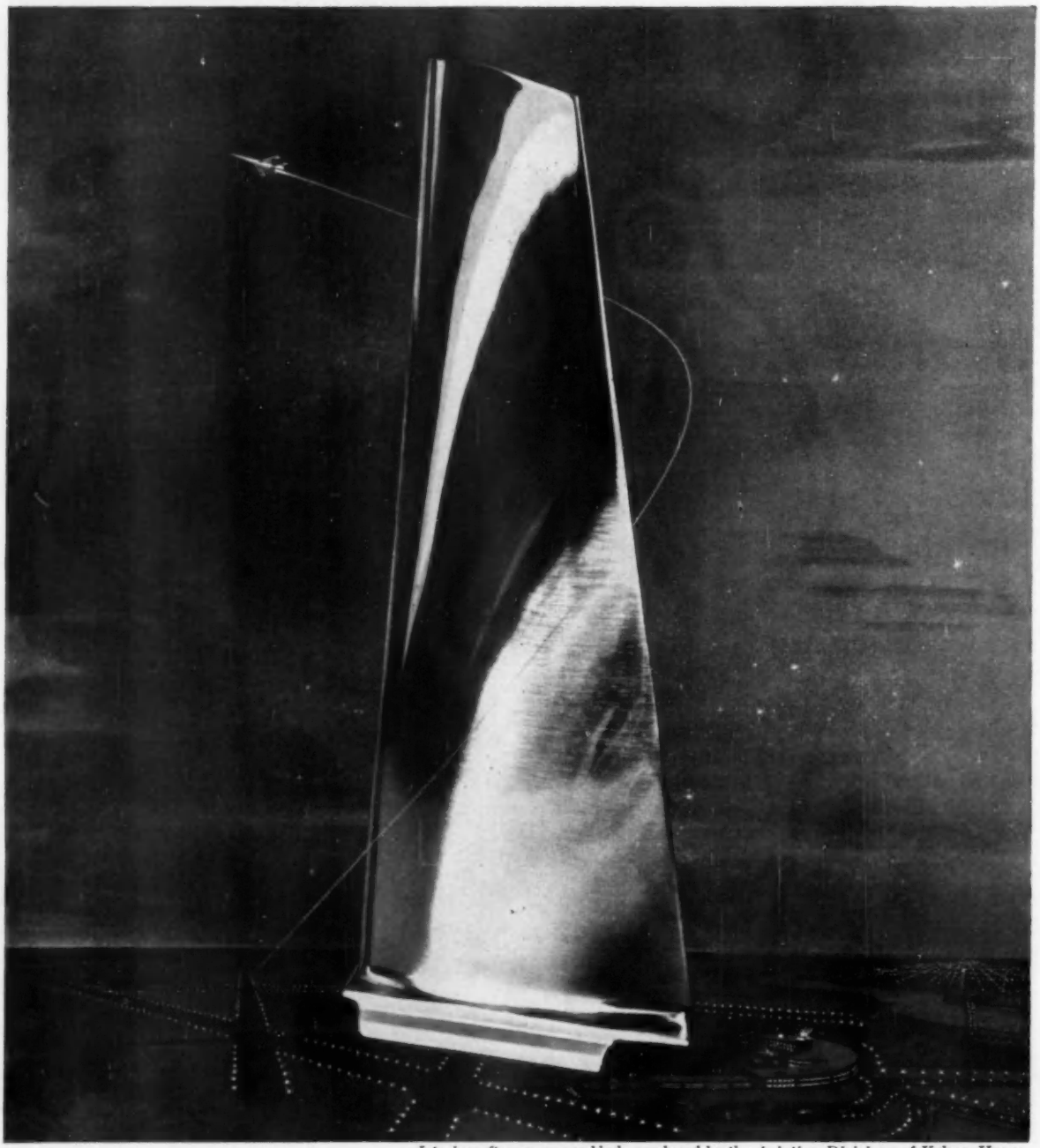
Since 1914 — leader in the field

PARKER RUST PROOF COMPANY

2178 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE	TROPICAL
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces	heavy duty maintenance paints since 1883

**Bonderite, Bonderlube, Parco, Parco Lubrite, Parker Pre-Namel—Reg. U.S. Pat. Off.*



Jet aircraft compressor blade produced by the Aviation Divisions of Kelsey-Hayes.

precision blades for flight propulsion

Superalloy blades, buckets and vanes—*precision components for rotating and static assemblies*—are products of the Aviation Divisions of Kelsey-Hayes. Kelsey-Hayes also produces through its own vacuum melting facilities, the special alloy metals that go into these and other products demanding high tensile strength in the high temperature field. Kelsey-Hayes Company, General Offices: Detroit 32, Michigan.

KELSEY-HAYES

Aviation, Automotive and Agricultural Parts • Hand Tools for Industry and Home.

15 PLANTS / Detroit and Jackson, Michigan; McKeesport, Pennsylvania; Los Angeles, California; Windsor, Ontario, Canada Jackson, Michigan • Springfield, Ohio—2 plants—(SPECO Aviation Division) • Utica, New York—4 plants—(Utica Drop Forge and Tool Division) • Davenport, Iowa (French & Hecht Farm Implement and Wheel Division)

CRACKS THE "HEAT BARRIER" FOR THE CRUSADER!

HARRISON COOLS CHANCE VOUGHT'S SUPERSONIC F8U-1

Sky-high and still streaking up . . . but heat's always down to earth! Chance Vought's *F8U-1 Crusader* depends on Harrison to handle the sizzling engine temperatures encountered in supersonic flight. These heat-exchangers are durable, dependable . . . they're compact, lightweight, and specifically designed to provide the most efficient cooling for America's most advanced aircraft. Aircraft manufacturers can rely on Harrison, with over 46 years' experience in the research and design of heat-control products. If you have a cooling problem, look to Harrison for the answer.

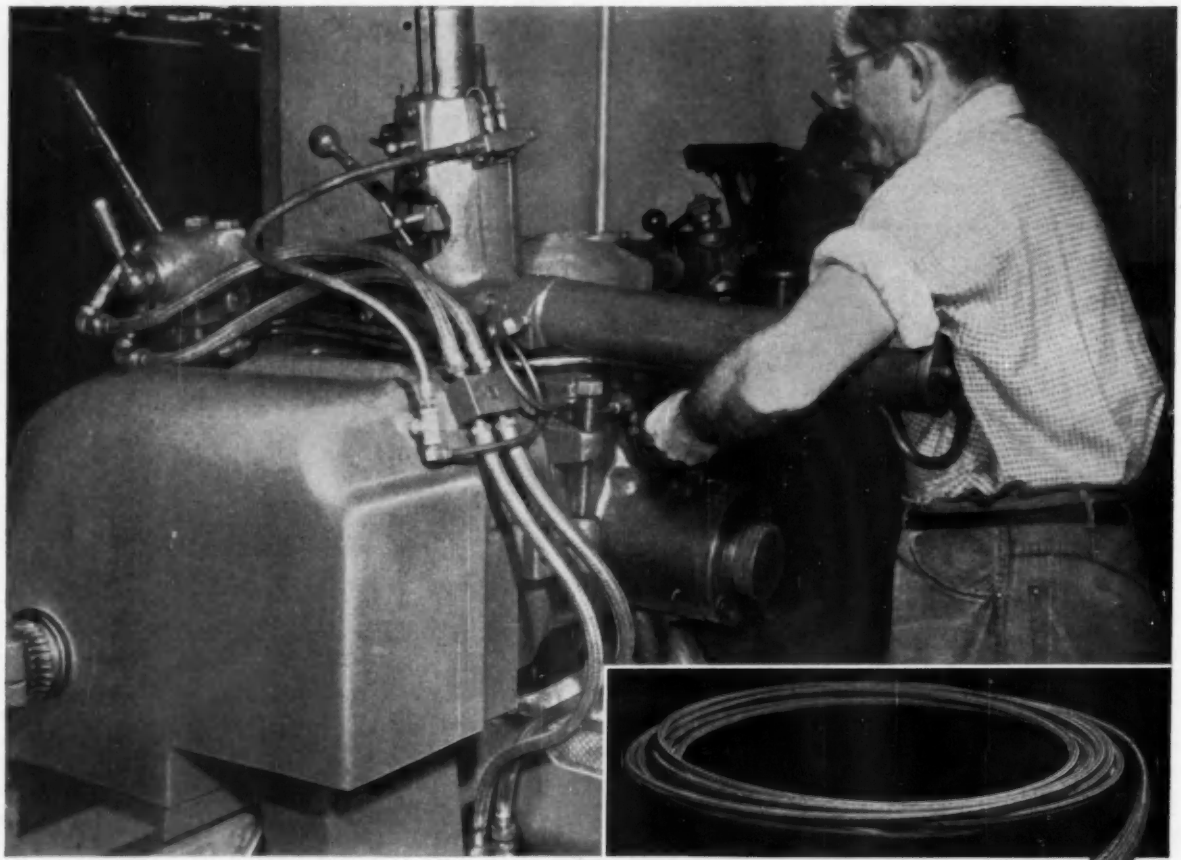
Watch WIDE WIDE WORLD Sundays on NBC-TV

TEMPERATURES MADE TO ORDER

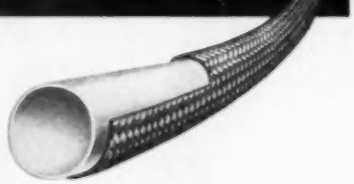
GM GENERAL MOTORS

HARRISON

RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N.Y.



Where to use R/M FLEXIBLE THIN-WALL Teflon* HOSE in automotive and aircraft applications

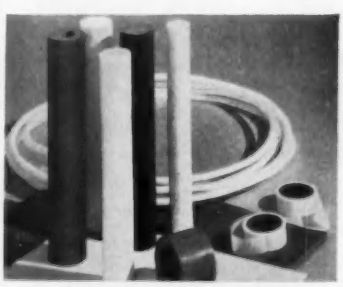


Wherever corrosive fluids, high mechanical stresses, or extreme ambient temperatures are involved in lines which must handle fuels, lubricating oil or hydraulic fluid, R/M Flexible Thin-Wall "Teflon" Hose provides easy solutions to difficult problems.

For example, take the precision centerless grinder above, which is used in the manufacture of critical aircraft components. Lines supplying its hydraulic infeed drive system must be flexible. They must handle cycling pressures in the range of 75 to 90 psi. R/M Flexible Thin-Wall "Teflon" Hose was found ideal for this troublesome application. It offers equal advantages in countless difficult aircraft and automotive applications, for it serves continuously in temperatures ranging from −100 to 400°F without failure, lasts many times longer than similar hose of other materials, and is unaffected by aging or the highly corrosive agents it may encounter.

R/M Flexible Thin-Wall "Teflon" Hose, with wire-braided or rubber cover, is available through leading coupling manufacturers. We have pioneered in the development of products of "Teflon" for use in the automotive and aircraft fields. Write us for complete specifications on R/M "Teflon" products and name of nearest supplier.

*A Du Pont trademark



Other R/M "Teflon" products for the automotive and aviation industries include rods, sheets, tubes and tape; centerless ground rods held to very close tolerances; stress-relieved molded rods and tubes; and Raylon, a mechanical grade of "Teflon" with many of the properties of virgin "Teflon." For details, call or write R/M.

RM

RAYBESTOS-MANHATTAN, INC.

PLASTIC PRODUCTS DIVISION, MANHEIM, PA.

FACTORIES: Manheim, Pa.; Bridgeport, Conn.; No. Charleston, S.C.; Passaic N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Engineered Plastics • Asbestos Textiles • Mechanical Packings • Industrial Rubber • Sintered Metal Products • Rubber Covered Equipment
Brake Linings • Brake Blocks • Clutch Facings • Abrasive and Diamond Wheels • Laundry Pads and Covers • Industrial Adhesives • Bowling Balls

PUZZLED OVER SOURCES

FOR *malleable, pearlitic malleable, carbon steel, alloy steel*

CASTINGS?

Then National is your answer. We play no favorites, have no prejudices —for we cast all these metals.

From our six strategically located foundries, we can supply castings in HTM (Hi-Tensile Malleable), standard malleable, carbon or alloy steel. That means you get all the "multiple source" advantages . . . yet you deal with *one* company having unparalleled facilities in *many* plants. Remember, it's just a *part* of the National story—flexibility of production with individual attention.

AA-4574

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Established 1868 • Cleveland 6, Ohio

The nation's largest independent producer of malleable and pearlitic malleable

Bridgeport Aluminum Shapes

put extra pay in payload... extra profit in production

BRIDGEPORT EXTRUSIONS ARE LIGHTWEIGHT, STRONG *—for extra payload profits, more compact assemblies*

AVAILABLE IN A COMPLETE LINE OF STANDARD SHAPES *without die charge*

DURABLE AND ATTRACTIVE - *resist corrosion, always good-looking, no maintenance problems*

MADE TO EXACT TOLERANCES—*assure rigid, weathertight fits—easy to handle and assemble*

AND YOU GET THESE EXTRAS, TOO, with BRIDGEPORT • *"Big producer" capacity* • *Experienced technical help* • *Consistent high quality* • *Service that is unsurpassed*

Your nearest Bridgeport Office is ready to serve you. Call today.

ROOF RAILS – BRIDGEPORT extruded sections always fit perfectly, make assembly fast and easy.
SIDE POSTS – for exterior post or smooth side construction – provide strong, weathertight body.
SIDE RAILS – big, tough, rugged sections designed for maximum capacity loads.
FLOORS – exclusive dry floor and snap-in refrigerator sections for strong, long-wearing floors.

NEW ALUMINUM EXTRUSIONS BOOK

Write on your letterhead for Bridgeport's new Aluminum Extrusions Handbook—a 130-page manual with complete sections on truck and trailer construction, full size shapes available, data, limits and tolerances.

For the very newest in

BRIDGEPORT ALUMINUM

BRASS Bridgeport CO.

Aluminum Extrusion and Forging Facilities at Adrian, Michigan
Bridgeport Brass Company, Aluminum Division
Bridgeport 2, Connecticut • Offices in Principal Cities

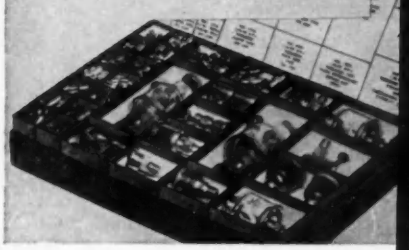
Design "Low Cost" Into YOUR Equipment

GITS

World's Largest Selection of Low-Cost Lubricating Devices

LUBRIKIT . . . An assortment of 95 oil cups of 29 different types. Gits sales records show these oilers are most used for replacement and maintenance. Contents of each separate bin are clearly described on Inside Cover.

Special Introductory Price
Just $14.95 F.O.B. Factory
Satisfaction or your money back



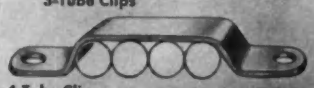
CLIPS FOR ATTACHING TUBING

When ordering, specify ¼", ⅜" or ⅜" tubes. Style TF.

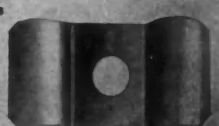
Single Clips

Double Clips

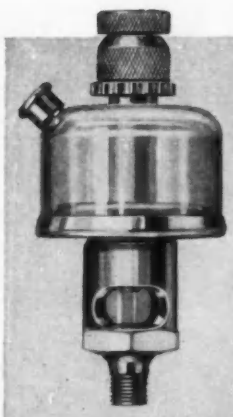
3-Tube Clips



4-Tube Clips



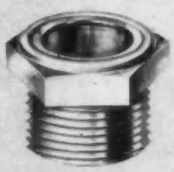
Double Clips — Wing Type



SIGHT GRAVITY FEED OILERS

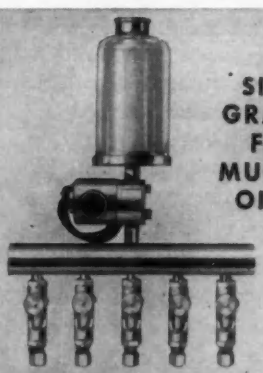
Rate of oil flow regulated by needle valve, directly observed through sight glass in stem.

Shut-off knob does not affect needle valve adjustment. Visible oil supply. Non-breakable. Tops in convenience and dependability, at low cost. Style NFU—No. 3602-A.



GEAR CASE GAUGES

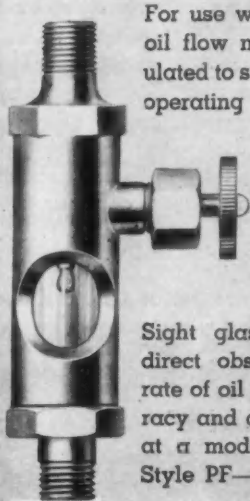
This oil gauge plug permits instant checking of oil level within a transmission or gear case. For use where construction permits insertion in tapped hole. A valuable addition to any such equipment — at very low cost. Style BW—No. 4042.



SIGHT GRAVITY FEED MULTIPLE OILERS

This one unit replaces 3 to 8 individual oilers. Maximum practicality in a small central lubrication system. Positive cut-off during idle periods. Individual vibration-proof needle valve adjustments. With solenoid control (Illustrated): Style MDS—No. 4685-A. Without solenoid: Style MD.

SIGHT GAUGES



For use where rate of oil flow must be regulated to suit changing operating conditions. Needle valve permits extremely accurate adjustment of oil feed. Sight glass provides direct observation of rate of oil flow. Accuracy and convenience at a moderate price. Style PF—No. 4290.

Don't price yourself out of the market. When you design proper lubrication into your equipment, specify GITS Lubricating Devices—the widest selection available anywhere. The items pictured above are only a few of our many thousands of lubricating devices. At the design stage, get the GITS story. Free Engineering Service. Send NOW for your free Catalog.

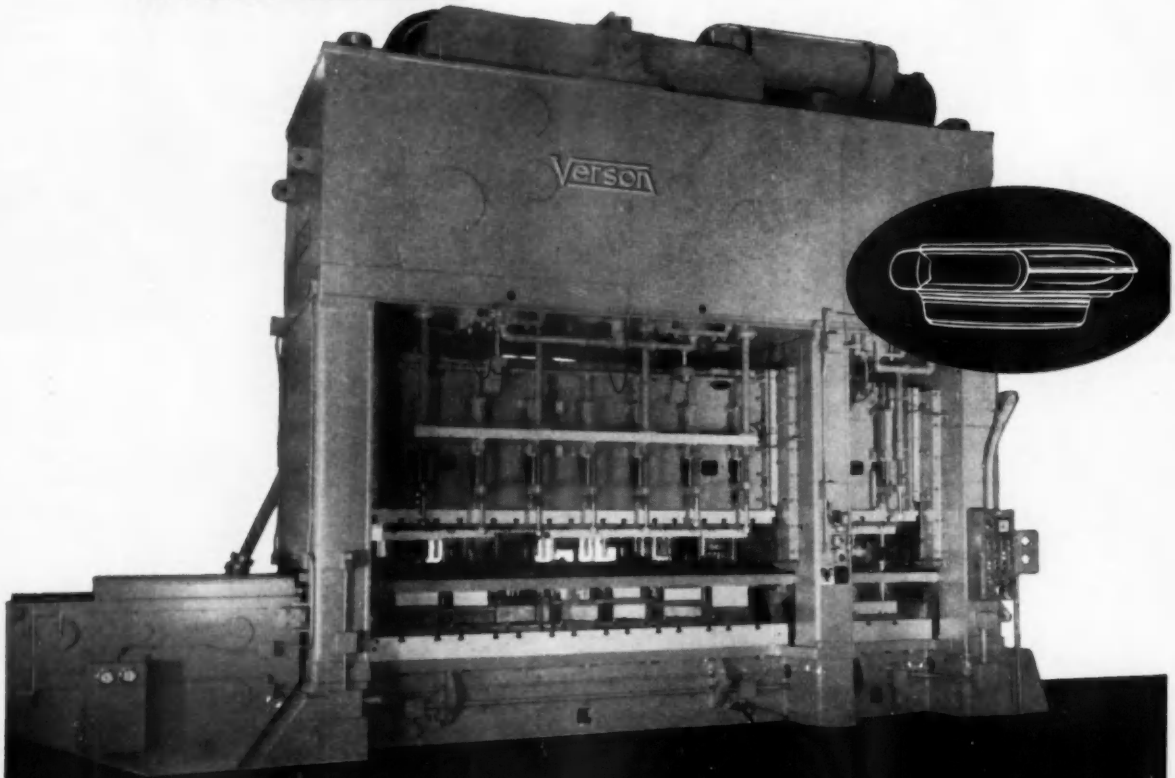
GITS BROS. MFG. CO.

The Standard For Industry For Almost Half A Century

1870 South Kilbourn Avenue
Chicago 23, Illinois

Clip this page for handy "rough reference"

this Verson TRANSMAT PRESS



is producing **1000 automotive air cleaner shells per hour automatically**

In another cost cutting production process engineered by Verson, this 900-ton two-slide Transmat press completes 1000 air cleaner shells every hour without human handling. The intricate part is formed from coil stock in eight consecutive operations.

Verson Transmat Presses offer unusual economy and efficiency whenever four thousand or more pieces, requiring four or more operations, are produced per day. Essentially a single press with multiple die stations and separately adjustable slides, the Transmat transfers the work piece by mechanical fingers synchronized with the press action. Feeding can be from coil stock or blanks. Intermediate handling, pickling or annealing is unnecessary.

The Verson Transmat is more than a press . . . it is a production process that can substantially reduce unit costs on a wide variety of mass produced stampings. Whatever your requirements, however — from several hundred to many thousand stampings per day — we will be happy to recommend the production process best suited to your needs. For specific recommendations, send an outline of your production problem.

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9307 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

Style MD.

MILESTONES IN POWER PROGRESS

(NO. 4 IN A SERIES)

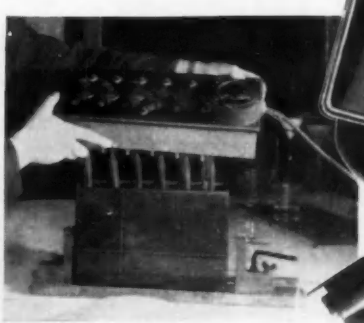
1912 — First electric starter

1952 — First thin-wall plastic case was introduced by GLOBE

The first electric starter made good batteries absolutely essential to trouble-free motoring. And Globe-Union — already pioneering in the field — has kept right on working through the years to make those good batteries even better. A typical Globe improvement "first" is the thin-wall plastic battery case—perfected in 1952 after 10 years of research to provide—

21% more acid capacity
96% increase in resistance to impact
40% greater resistance to acid penetration

Impact test



Bulge test

The battery that's built to take brute punishment and *give* peak performance for tens of thousands of hard-driving miles. Proof of strength is thin-wall container's score on the "Impact test and Bulge test" as illustrated above. Proof of container's extra acid capacity is shown in side-by-side comparison of thin-wall plastic design with composition material design . . . use of new plastics also means less acid absorption without contamination of acid.

Another milestone in power — another first for Globe!

FASTER, LOW-COST DELIVERY!

Globe's sixteen plants are strategically located for fastest, lowest-cost shipments to all markets; fourteen (*) are producing creatively packaged dry-charged batteries.

*ATLANTA, GA., *DALLAS, TEXAS, *EMPORIA, KANSAS, *HOUSTON, TEXAS, *LOUISVILLE, KY., *MEDFORD, MASS., *MEMPHIS, TENN., *MILWAUKEE, WIS., *MINERAL RIDGE, OHIO, *PHILADELPHIA, PA., *REIDSVILLE, NO. CAROLINA, *SAN JOSE, CALIF., *HASTINGS-ON-HUDSON, N. Y., *LOS ANGELES, CALIF., OREGON CITY, ORE., AJAX (ONTARIO) CANADA

SPINNING POWER
GLOBE-UNION
SPLIT-SECOND STARTING

GLOBE-UNION INC.

MILWAUKEE 1, WISCONSIN

If it's Petroleum-powered there's a GLOBE-BUILT BATTERY right from the start!

Tru-Stop Brakes

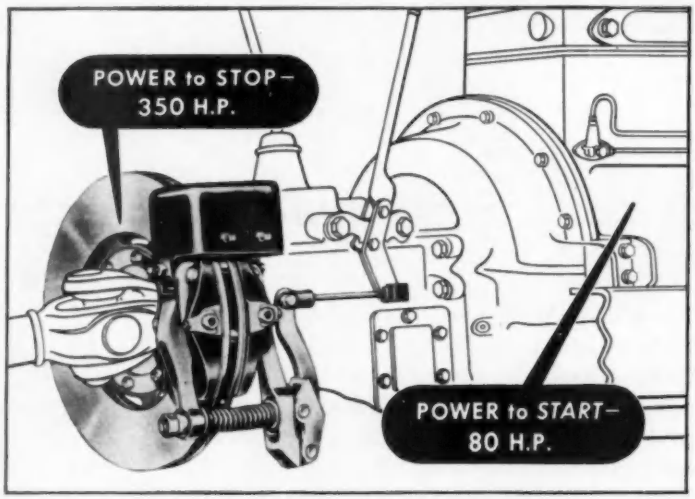
Meet Every Heavy-Duty Safety Requirement

OFFER POSITIVE PROTECTION AGAINST RUNAWAY OR PARKING ACCIDENTS—AT LOWEST COST

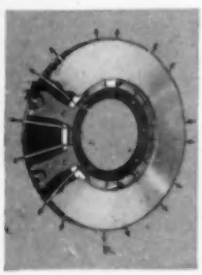
HERE IS WHY:

They have surplus power required for emergency service—no dangerous self-energizing

TRU-STOP Heavy-Duty Emergency Brakes are not only excellent parking brakes. They serve as a complete, independent and fully reliable braking system. Operating on the propeller shaft they enable the driver to continue on safely in the event of service brake failure. TRU-STOP brakes have the surplus braking capacity to be used *repeatedly* as an auxiliary to service brakes.

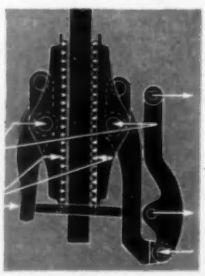


Brakes actually do more work than the engine in terms of horsepower Where it takes 80 HP to accelerate to 20 miles per hour, it takes 350 HP to make a safe stop from 20 miles per hour within required limits



Ventilated to throw off heat

Brake efficiency depends on ability to throw off intense heat—rapidly. Discs of TRU-STOP brakes are exposed to the air even during the braking operation. Ventilated design circulates air *between* the disc plates.



Give uniform brake pressure

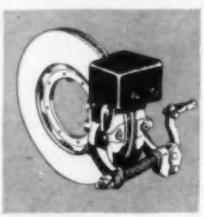
Disc of TRU-STOP brakes is "squeezed" between the flat surface of the shoes. Effort applied to brake lever operates front and rear lever arms simultaneously. Pressure is exerted on the center of each shoe. Entire lining surface is in contact.

TRU-STOP HEAVY DUTY BRAKES OUTPERFORM AND OUTLAST DRUM-TYPE BRAKES

DON'T LET THE SURFACE AREA FOOL YOU!

Drum-type brake

43¼ square inches of lining. Lining covers 310 degrees of the drum. *BUT* only 50 degrees of the lining-covered drum is exposed to the air.



Tru-Stop brake

28 square inches of lining. 90 degrees of the disc under pressure. *BUT* 270 degrees of the disc is exposed to air. Directing and throwing off heat is basis of brake efficiency.

THE TEST

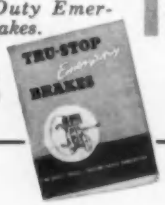
Drum-type Brake **vs** ***Tru-Stop Brake***

After a few light and two heavy applications from 20 MPH, lining was useless for further test.

Repeatedly stopped vehicle from 50 MPH—was then used to decelerate on steep grades. No serious damage to lining.

We will be glad to answer any questions or give you more detailed information about TRU-STOP Heavy Duty Emergency Brakes. Send for

Catalog DH 33



Automotive and Aircraft Division
AMERICAN CHAIN & CABLE

601 Stephenson Building, Detroit 2
2216 S. Garfield Street, Los Angeles 22 • Bridgeport 2, Conn.

ACCO

How T&W Technique is applied to serve the construction equipment industry better

If you are building construction equipment, investigate *T & W Technique* for producing forgings and deep drawn stampings. At the right are two examples of how a fully coordinated team of engineering and production facilities at T & W's Forging and Stamping Divisions serve industry better.

Send a sample or print of your part, today, for estimates.

SALES OFFICES | NEW YORK • PHILADELPHIA
CHICAGO • INDIANAPOLIS • DETROIT
HOUSTON • LOS ANGELES

Forgings and Deep Drawn Stampings

The valve cover produced in our Stamping Division measures 7⅛ inches wide, 36⅛ inches long, and 3⅛ inches deep. You can depend on T & W for your stamping requirement.

The double roller-type forging weighs 117 pounds; largest diameter 12 inches.

FORGINGS AND DEEP DRAWN STAMPINGS

TRANSUE & WILLIAMS

Over 50 years of experience

ALLIANCE, OHIO—USA

bright idea

For enduring beauty that sells in a new car and re-sells in a used car . . . design it, improve it and protect it with McLOUTH STAINLESS STEEL.

specify

McLOUTH STAINLESS STEEL

HIGH QUALITY SHEET AND STRIP

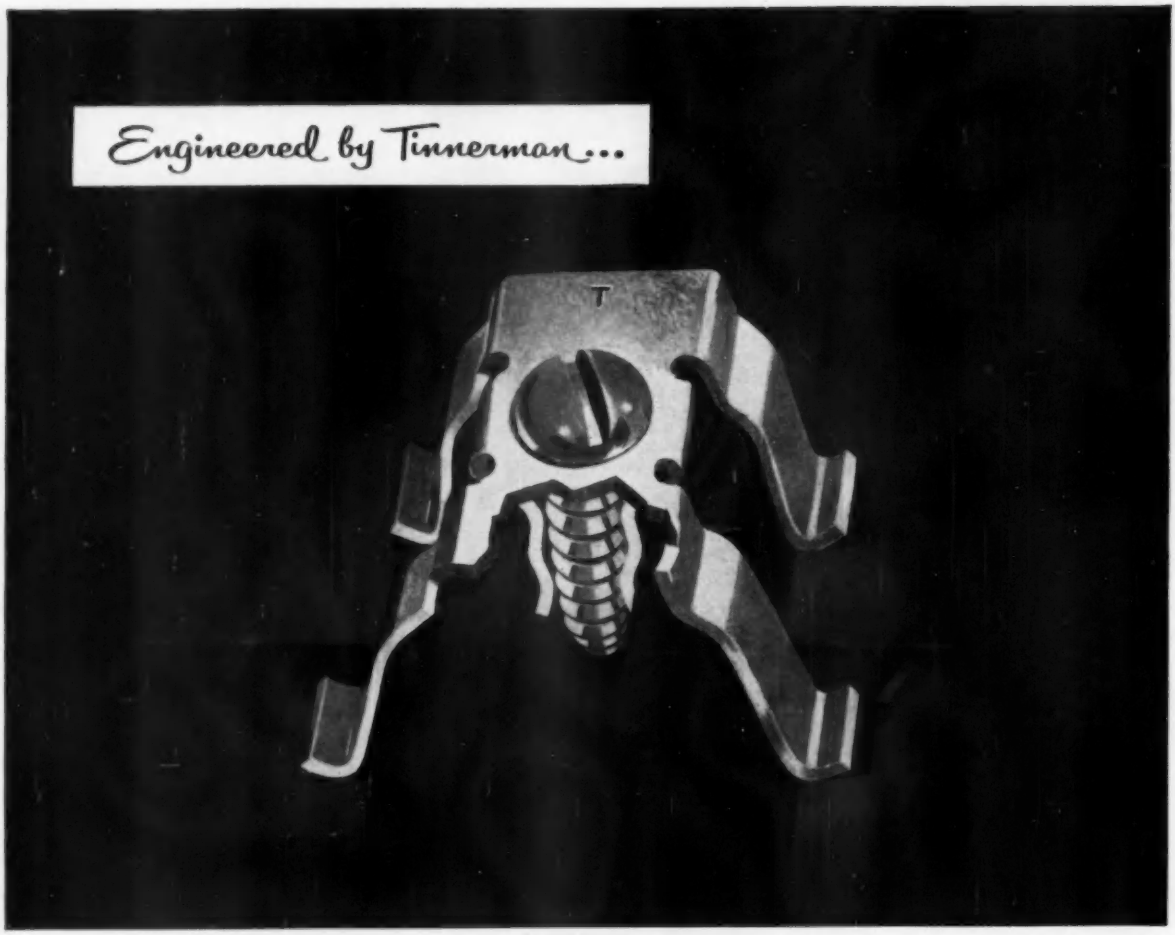
for automobiles

McLOUTH STEEL CORPORATION DETROIT, MICHIGAN

MANUFACTURERS OF STAINLESS AND CARBON STEELS

Warco PRESS
Federal-Warco
"PACKAGED"
METAL-WORKING LINES
Federal
Federal
Federal
Federal
Automated production
From basic metal to finished product
Here's one source responsibility for the design, construction and service of a complete line for the production of almost any metal part or product.
Whatever is required—drilling, machining, forming, welding, etc.—is designed into basic line—conserving space, taking advantage of common drives and integrated feeding and eliminating multiple service responsibility.
You'll want to know more about this sensible approach to modern metal fabrication. Have a Federal-Warco engineer show you one of these packaged lines in actual operation soon.
Federal WELDERS
THE FEDERAL MACHINE AND WELDER COMPANY
Warco PRESSES
WARREN, OHIO

263



6-fingered **SPEED CLIP**®
holds glass panels tight, saves 46%!

This special SPEED CLIP fastens glass panels to aluminum extrusions with a grip that prevents slippage. Heat stays in, rain stays out of greenhouses and similar glass structures. Working closely with engineers of the Metropolitan Greenhouse Mfg. Corp., Brooklyn, Tinnerman developed this unique fastener that saves almost one-half the cost of former less effective assembly methods!

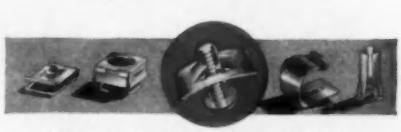
Installation is fast and simple. Two overlapping glass panels are positioned against the extrusion. A screw driven into the spring-steel SPEED CLIP spreads the two center fingers outward to grip the inner walls of the extrusion. No secondary fastening devices required—SPEED CLIPS hold tight, yet are easily removed to permit replacement of glass.

This is another example of a fastener engineered by Tinnerman to satisfy special, complicated fastening problems. A Fastening Analysis of your products may produce a similar cost-cutting solution. See your Tinnerman representative soon.

TINNERMAN PRODUCTS, INC.
BOX 6688 • DEPT. 12 • CLEVELAND 1, OHIO

TINNERMAN

Speed Nuts®



FASTEST THING IN FASTENINGS®

Canada: Dominion Fasteners, Limited, Hamilton, Ontario. Great Britain: Simmonds Aerocessories, Limited, Treforest, Wales. France: Simmonds, S. A., 3 rue Salomon de Rothschild, Suresnes (Seine). Germany: Hans Sickinger GmbH "MECANO", Ewago-F-Clips.

as LIGHT as aluminum —WEARS like iron

Unretouched photo of VANASIL piston

MICRO-X VANASIL pistons have run way over 200,000 miles with only *.002"* to *.005"* wear on the top ring grooves. How much wear develops in top ring grooves on the pistons you are using—in 100,000 miles? In 200,000 miles, if they are ever run that far?

Do your owners have rings break because of badly worn grooves, causing a breakdown on the road and a costly tow-in job as well as lost time and an engine overhaul? *Vanasil Pistons reduce top ring groove wear up to 75%!*

You Get ALL these Advantages only in

VANASIL PISTONS

Patented Vanadium — Silicon — Aluminum Alloy

1. **LIGHT WEIGHT**—Same as other aluminum alloys.
2. **SCORING, SCUFFING MINIMIZED**—Because of "Oil-absorbing" microscopic porous texture.
3. **LONGER LIFE** — 30% less friction — 30% harder, outwears other aluminum alloys several times.
4. **TOP RING**—Breakage virtually eliminated because of reduced ring groove wear.
5. **LOW EXPANSION**—Characteristics of Cast Iron.
6. **CLOSE CLEARANCES**—Fitted with Cast Iron Clearances.
7. **SOLID SKIRT DESIGN**—No expansion devices required.
8. **HIGH HEAT CONDUCTIVITY**—Similar to other aluminum alloys.
9. **GRAIN GROWTH**—None.
10. **PLATING**—No tin or other break-in coating required.

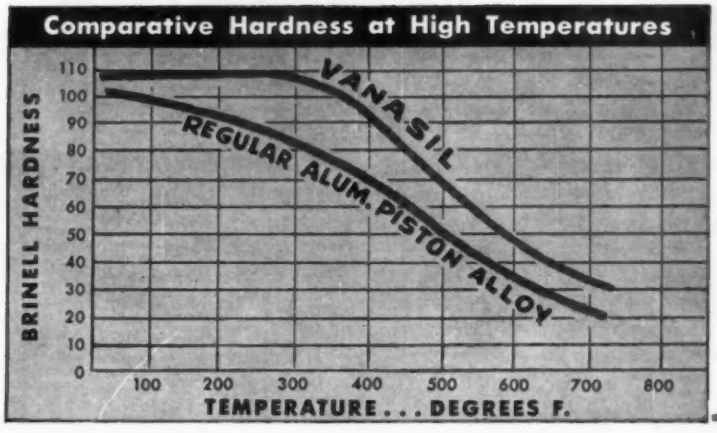
VANASIL Piston Warehouse Stocks:

CALIFORNIA—Automotive & Industrial Whse. Co., 1341 So. Hope St., Los Angeles 15
Piston Supply Warehouse, 2768 Grove St., Oakland 12
FLORIDA—H & M Parts Warehouse, 1086 W. Adams St., Jacksonville
NEW YORK—Bethlehem Equipment Co., 109 W. 64th St., New York 23

MICRO-X VANASIL PISTONS
for Gasoline and Diesel Engines

GILLETT & EATON, INC. • Est. 1868
841 DOUGHTY ST., LAKE CITY MINNESOTA

Comparative Hardness at High Temperatures



SEND COUPON

GILLETT & EATON, INC.
841 Doughty St., Lake City, Minn.

Please send circular and prices on Vanasil Pistons in over 60 types and sizes for gasoline and diesel engines.

Name .....

Firm Name .....

Address .....

backed by a 50-year
record for dependability . . .

★ ★ ★ ★

STEWART-WARNER

INSTRUMENTS AND GAUGES

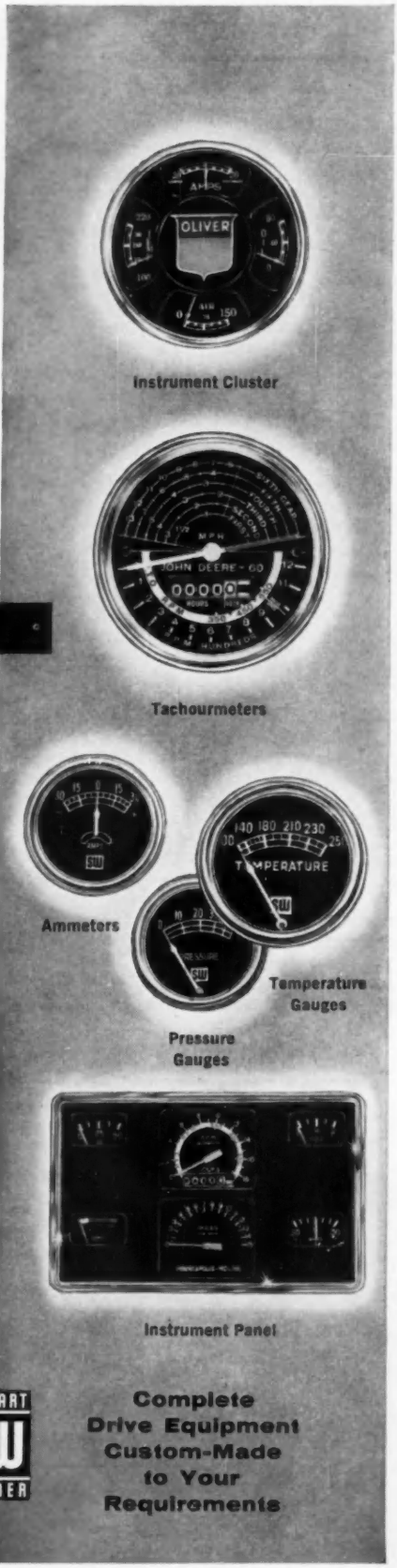
including complete drive equipment—designed, engineered and manufactured to your specifications

. . . all from one manufacturing source!

For half a century, Stewart-Warner has made quality instruments and gauges for agricultural applications.

Many leading implement manufacturers capitalize on this unmatched experience and know-how by specifying Stewart-Warner equipment *exclusively.*

The complete Stewart-Warner line offers you a wide choice of gauges, speedometers, tachometers, and tachourmeters. Entire panels can be custom-made to your own specification. Everything you need for a complete installation—including flexible shafts, gears, and adapters. Let Stewart-Warner supply *all* your instrument needs—*from one dependable manufacturing source.*



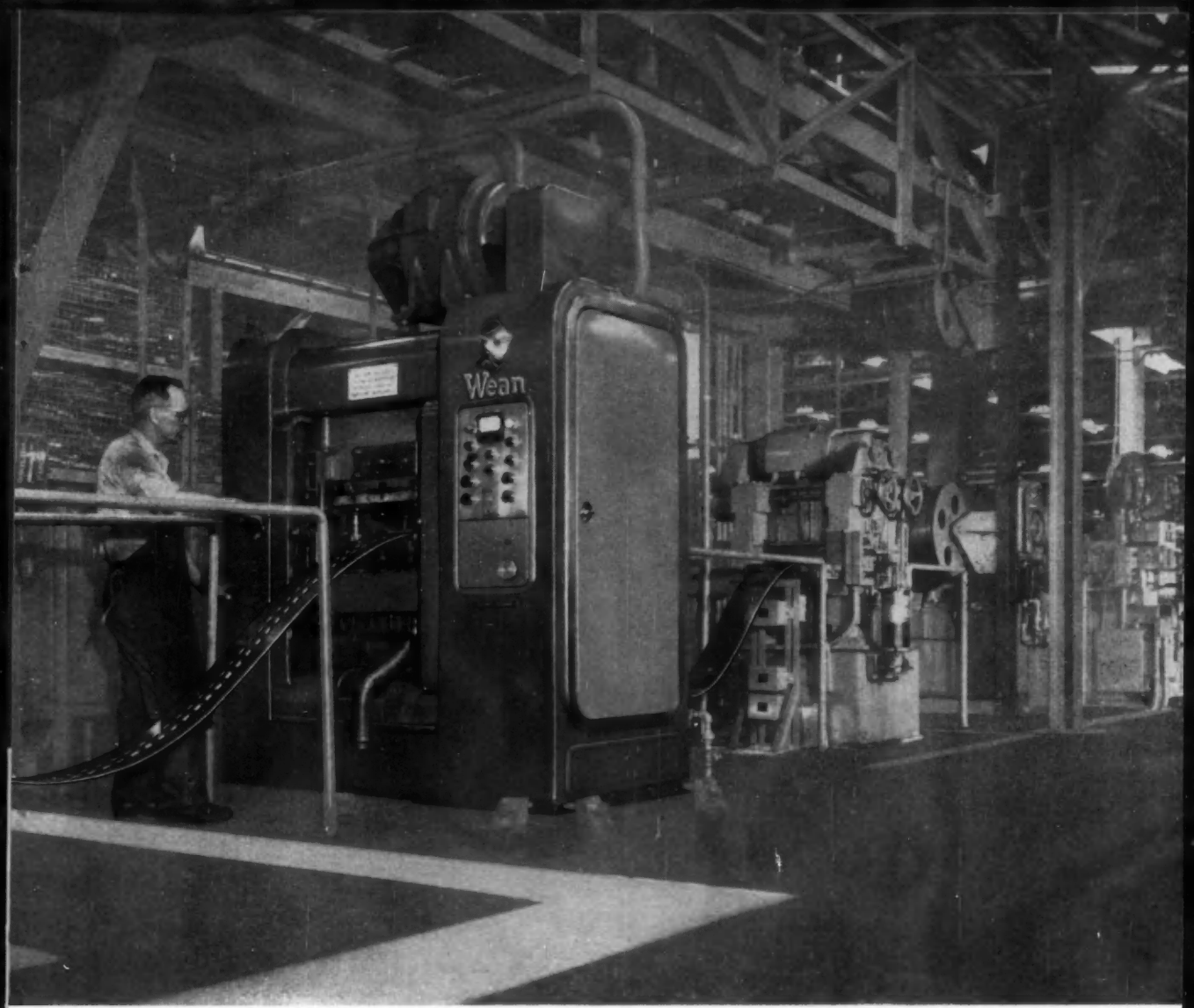
For further information, write:

STEWART-WARNER

Dept. X-57, Original Equipment Sales
1840 Diversey Parkway, Chicago 14, Illinois

STEWART SW WARNER

Complete Drive Equipment Custom-Made to Your Requirements



The Wean "Flying Press"

continuous strip feed eliminates stop-and-go operation in production lines

In many production lines utilizing conventional presses, the production rate of the entire line is governed by the speed of the press. Thus, though the balance of the line may have a higher production potential, actual production is curtailed by the old-fashioned stop-and-go action of the press. In the case of the Wean "Flying Press", however, the combination of a continuous feed principle plus speeds many times in excess of conventional press rates enables a production line to produce at maximum capacity.

High speed, automated and semi-automatic operations in particular benefit from the many revolutionary advantages inherent in the Wean "Flying Press".

Built in feed rolls — press feed, can be varied while press is running — all controls centralized . . . . these are but a few of the many features of the Wean "Flying Press". We could discuss simple floor mountings, ultra-high speed operation and many other advantages. However, you can get the complete story by writing today for your copy of the Wean "Flying Press" brochure.

Wean Equipment Corporation

CLEVELAND 17, OHIO

...as EVANS HEATERS

are right for trucks!

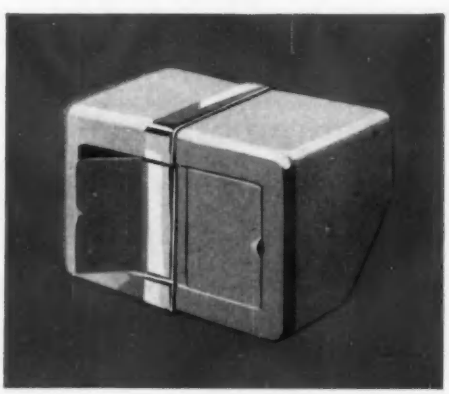
Tough jobs call for the right equipment. Heavy snow can't be cleared with a shovel and broom, and a truck can't be adequately heated by a heater built for passenger cars.

Evans heaters are right for trucks because they're built for trucks. They have the same rugged dependability you build into your trucks . . . the same high standards of manufacture that guarantee peak performance and low maintenance costs. The heaters Evans engineers design and custom-build for you will meet all your truck requirements. Our engineers will be glad to call and discuss your heater problems for any truck model, present or future. For information write Evans Products Company, Dept. P-5, Plymouth, Mich.

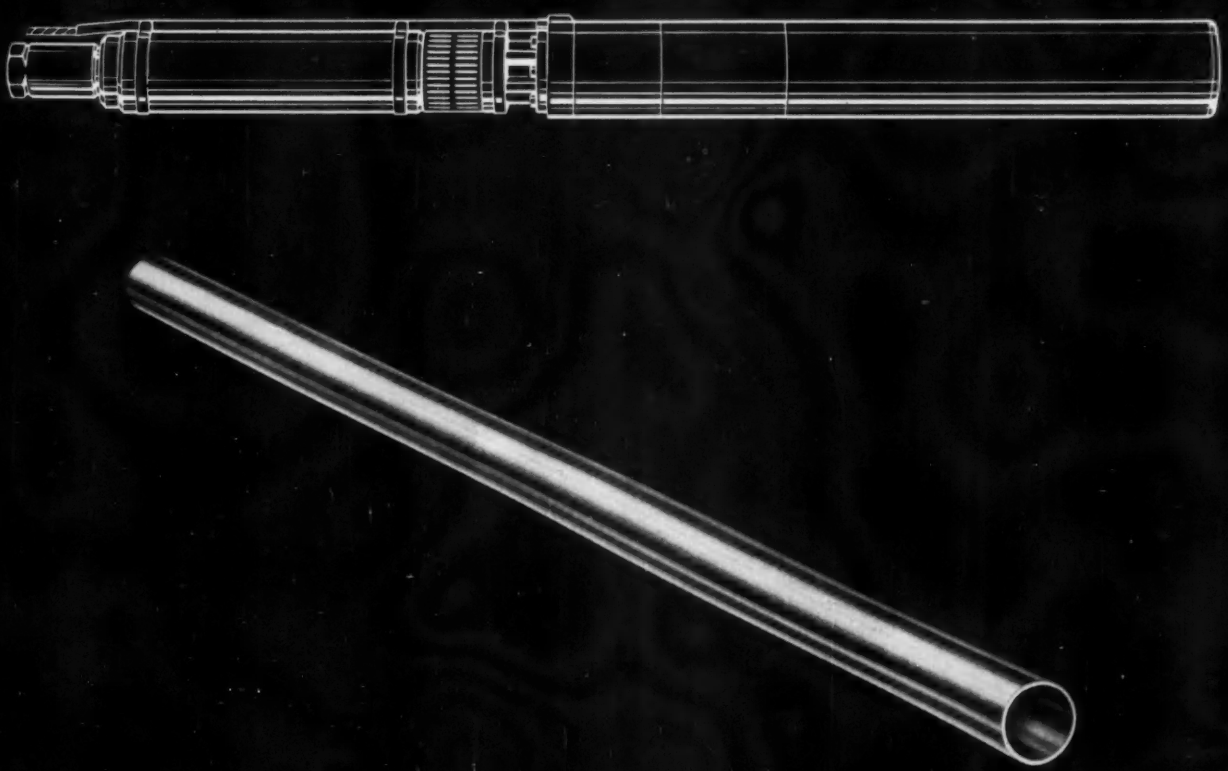
Regional Representatives: Cleveland, Frank A. Chase
Chicago, R. A. Lennox Co., Inc. • Detroit, Chas. F. Murray Sales Co.
Allentown, Pa., P. R. Weidner

EVANS HEATERS ARE RIGHT FOR TRUCKS BECAUSE THEY'RE BUILT FOR TRUCKS

EVANS PRODUCTS COMPANY ALSO PRODUCES:
railroad loading equipment; bicycles and velocipedes; Evaneer fir plywood; fir lumber; Evanite battery separators and Evanite hardboard.



CLEVELAND 17, OHIO



B&W ERW Mechanical Tubing Saves Time, Cuts Pump Production Costs 50%!

One manufacturer of submergible pumps had a bottleneck in its production line. The company had been using seamless tubing for their motor housings and pump housings—the design of the units called for precision tubing with close I.D. tolerances.

The company turned to B&W Electric-Resistance-Welded Mechanical Tubing.

After two years of using this close tolerance tubing, company engineers estimate they have been able to reduce their production costs on the components as much as 50%. What's more, the production of these parts has become the least troublesome in the manufacturing process!

Here's another example pointing out where B&W ERW Tubing is being used by industry to produce better products at lower cost. B&W Mechanical Tubing is available in a wide range of sizes, shapes, analyses, and finishes.

Get all the facts on savings from Mr. Tubes, your link to B&W. Call your local B&W tubing distributor. Write for Bulletin TB-419. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

TA-6088-M4

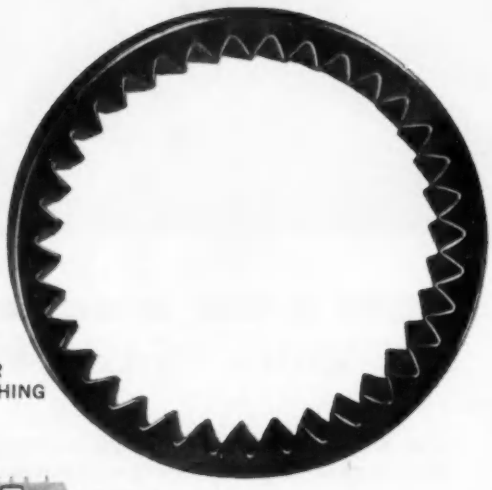
Seamless and welded tubular products, seamless welding fittings and forged steel flanges — in carbon, alloy and stainless steels

OSBORN BRUSHING METHODS worthy of your confidence

Automated finishing geared to your production

...at rates up to 300 pieces per hour

BEFORE BRUSHING



AFTER BRUSHING

THE automotive pump gears shown above are typical of a wide range of parts that can be precision finished with Osborn's line-production method.

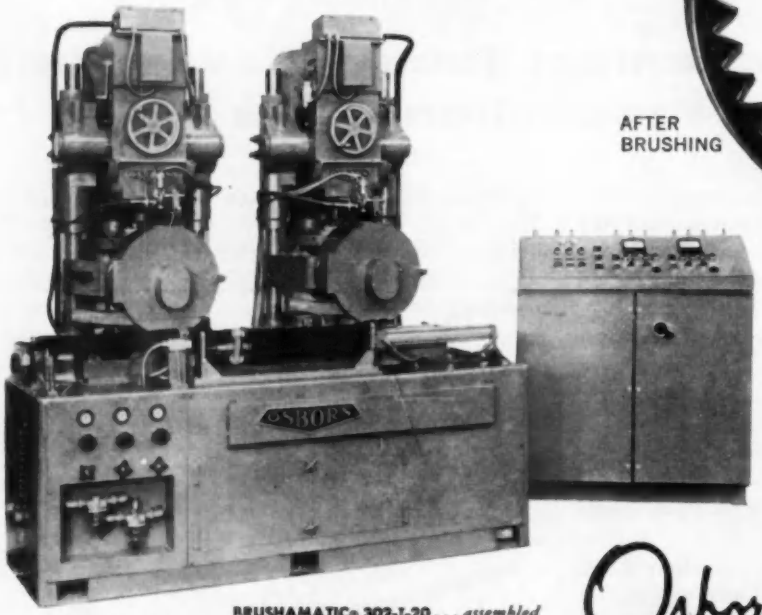
COMPLETELY INTEGRATED . . . Osborn's Automated Brushamatic® Equipment fits right into your production line.

ELIMINATES BOTTLENECKS . . . It is now possible to remove burrs, blend surface junctures, remove scale, clean parts on a continuous line-production basis.

AUTOMATES FINISHING OPERATIONS . . . Takes parts right from your production lines, feeds them to rotating power brushes, delivers them precision-finished to micro-tolerances where necessary.

. . . all without manual handling

Automated power brushing is just one example of the many ways Osborn is helping to improve production techniques. An **O**sborn **B**rushing **A**nalysis, made in your plant without obligation, may point out important benefits to your company. Write *The Osborn Manufacturing Company, Dept. E-52, Cleveland 14, Ohio.*



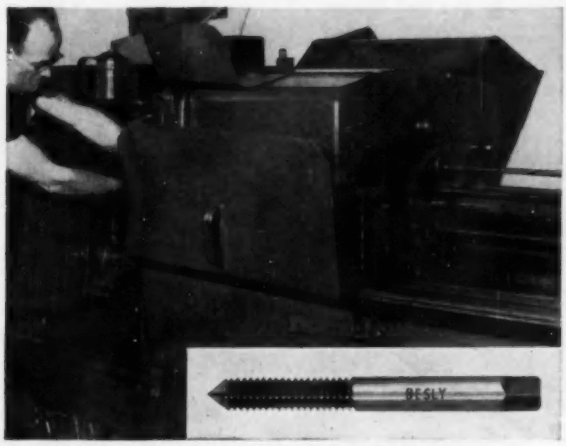
BRUSHAMATIC® 302-I-20 . . . *assembled from standard Brushamatic components which have been used in various combinations to fill a wide range of finishing requirements.*

Send TODAY for the new 20-page Brushamatic Booklet

Osborn Brushes

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING MACHINES • FOUNDRY PRODUCTION MACHINERY

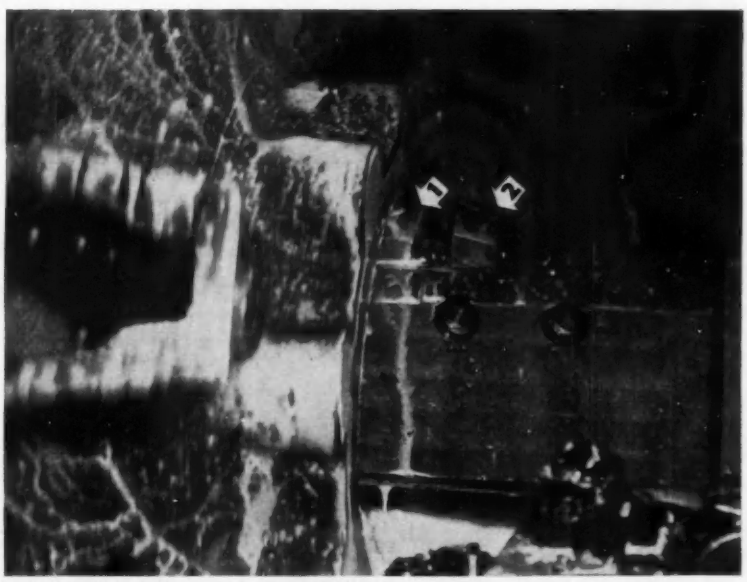
Cutting Tool and Gaging Methods . . . by BESLY



"ROLLING" THREADS IN COPPER—At Steel Industries, Inc., Crawfordsville, Ind., an automatic screw machine is being set up to size, bore and thread 1500 small, difficult-to-tap copper parts per hour. The Besly ¼-28" "X-Press" fluteless tap, shown, is used. H. M. Oshry, Vice-Pres., states, "Besly 'X-Press' Taps made it possible to use this high production method successfully. We get stronger, better, rolled (pressed, not cut) internal threads with no burrs or chips — longer tool life and fewer rejects."

MODIFIED TO FIT — The Gabriel Company, Cleveland, requires two concentric tapped holes in die-cast aluminum pistons used in their airplane type shock absorbers. Originally these were tapped individually — requiring 18 seconds per piece. To reduce this time, a unique set-up using Besly Taps was developed. A smaller Besly Tap is fitted inside the bored-out center of the larger Besly Tap. Two holes are now accurately tapped simultaneously in 9 seconds.

PRECISION ACCURACY—Bodine Electric Co., Chicago, uses Besly-Metro thread plug, thread ring, plain cylindrical plug and ring gages to assure precision accuracy of parts for electrical motor production. Asked why he uses them, A. Wermund, inspection foreman, says, "Last longer — sturdier built."



CARBIDE TOOLS IN ACTION — Cast steel truck wheels made by Gunnite Foundries Corp., Rockford, Illinois, are rough bored with a Besly BL-12-B5 Standard Carbide Tipped Tool, arrow 1, removing ⅛" to ⅜" of stock. On the same turret lathe a second Besly AL-12-B5 Standard Carbide Tipped Tool, arrow 2, semi-finish bores, removing .030" stock. Metal removal is at 200 S.F.M. at .016" feed. Besly's Engineering Service helped to achieve this efficient, low-cost metal removal set-up.

Prove to yourself that Besly Cutting Tools and Gages produce better results. Put them on trial on your toughest jobs, and check the difference in longer tool life, less down time, fewer rejects and faster production. If you'd like to try Besly tools or use Besly's Engineering Service, see your Besly distributor for details, or write us . . .

Engineering, Service and "Specials" . . . are a Besly Specialty

BESLY

BESLY-WELLES
CORPORATION
Est. as C. H. Besly & Co. 1875
132 Dearborn Ave., South Beloit, Illinois

TAPS • DRILLS • REAMERS • END MILLS • TOOL BITS • GAGES
CARBIDE TIPPED TOOLS, BLANKS, TOSS-AWAY INSERTS and HOLDERS

THIS LABORATORY TEST offers visual evidence of the carcass strains set up in a tire at high speed—shows why nylon's extra strength is so important in today's tires. Nylon cord withstands constant flexing and heat buildup.

IN THE TOUGHEST TEST of all, the lasting strength and shock-absorbing toughness of nylon tire cord has been proved in billions of miles of heavy-duty service on trucks. Nylon cord tires are standard equipment on commercial airlines, too.

TEST AFTER TEST PROVES NYLON TIRE CORD GIVES EXTRA STRENGTH FOR EXTRA SAFETY

These influential magazines will carry Du Pont nylon cord tire advertising frequently throughout the year. These ads tell your customers of nylon's lasting ability to shrug off the abuse of "just-around-town" driving and thus offer utmost safety on the highway.

The lasting strength and safety of nylon tire cord has been proved in the laboratory and on the highway. Nylon cord withstands the added strains of today's more powerful cars and the sustained speed permitted on superhighways. Nylon cord protects against the four major causes of blowout: heat, moisture, flex fatigue and bruise damage—gives motorists the added safety and dependability they want in a tire.

Nylon cord tires can reduce unsprung weight, and nylon's shock-absorbing toughness can take the additional strains of power steering, power braking and higher horsepowers. Surveys and rising sales show that today's motorists know and want the extra strength and safety of nylon cord tires.

Du Pont produces the nylon fiber.
All tire manufacturers make nylon cord tires.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Today, the strongest, safest tires are made with nylon cord

(Advertisement)

R B & W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

Nuts — their use and abuse

With bolts tightened to high load levels, nut performance becomes critical.

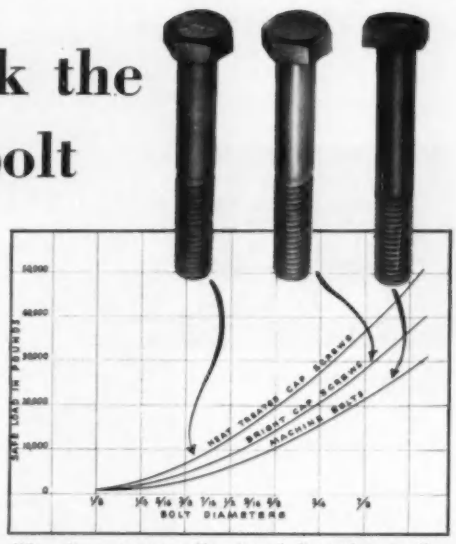
A nut produces bolt tension by rotating and advancing on the bolt threads. To do this, there must be a mating condition of threads, which is influenced by thread lead. Lead is a matter of tolerance only before bolt is stressed. When tightened, the nut is then under compression and threads tend to contract; the bolt is in tension, and threads tend to stretch. Lead of thread is affected–elastically *before* yield point, permanently *beyond* it.

This shortening of one lead and lengthening of the other has two effects. (1) The load distributes unequally along the threads (2) Torsion on bolt increases. Something has to give. For high tensile bolts especially, it is better for the nut to do so. A nut therefore should be soft enough so that it deforms plastically and compensates for off-lead. If it does, it *distributes* the load and can advance to increase tension.

"SOFT" NUTS DO MOST JOBS

"Soft" nuts do adjust more readily than hard ones under these severe conditions. While such nuts may not be as strong in shear as heat treated ones, the important point is the bolt tension they produce. As long as the nut can pull the bolt well into its plastic range, it is doing more than its share of the job.

How to pick the right size bolt



When it comes to uniformity of dimension, quality of head and thread, and ease of assembly, all RB&W cold headed fasteners are the same. They differ mainly in tensile strength as shown here.

ALMOST all bolt and cap screw strength requirements can be satisfied from three types of *standard* fasteners without recourse to costly special alloys. In the widely used middle range of sizes, the problem is one of deciding which makes the best joint, or which proves the most economical for the job.

MORE FOR LESS

Suppose, for example, you need a bolt safe for 20,000 pounds of loading. As the chart shows, you could use an RB&W ⅞" square-head bolt, a ¾" bright cap screw, or a ⅝" heat treated one.

If you have a lot of holes to fill, use the larger, lower strength fasteners. But to cut down number of bolts, or their size (and therefore cost), go to the higher tensiles. However you gain nothing if you don't tighten high tensile bolts to their full strength.

HOW COSTS COMPARE

In terms of holding power: For each $1.00 in high tensile bolts, it costs $1.50 to provide equivalent clamping force with bright cap screws; or $1.65 with machine bolts.

For more suggestions on fastener economy or for copy of above curves, write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

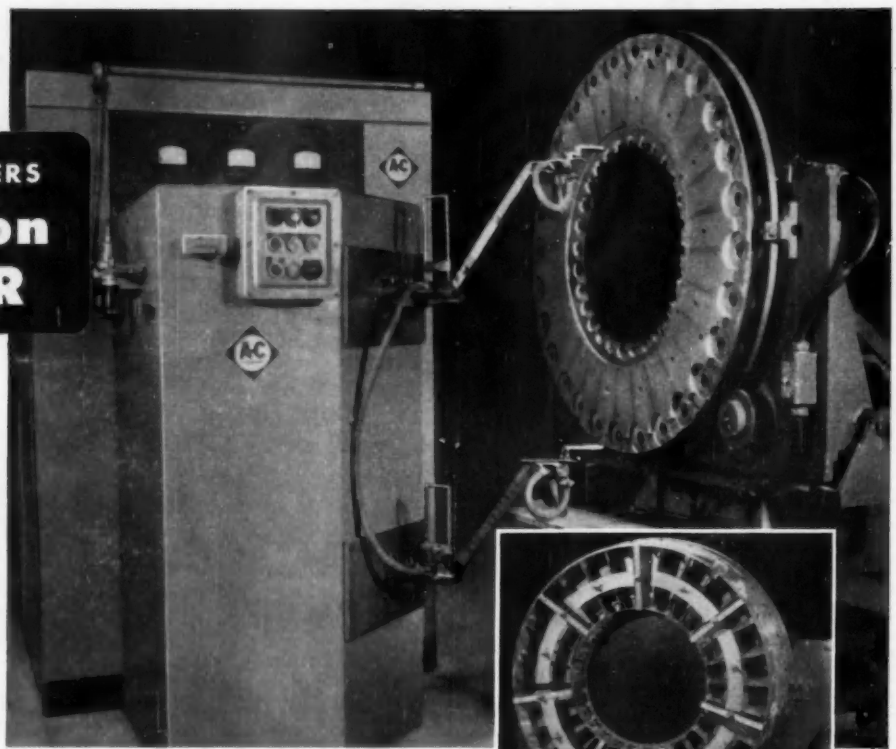
Spin-Lock Nuts dig in to stay tight

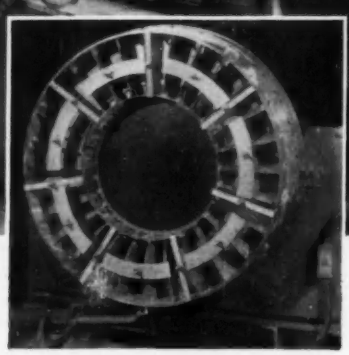
The photograph shows the many hardened "anchors" on the flange of a Spin-Lock Nut. These "ratchet-action" teeth require 20% more torque to loosen than to tighten. They bite in as the nut turns down on its seat. Like Spin-Lock Screws, these nuts can stay put in products subject to vibration and cyclic temperature variations. Send for bulletin.

RHEEM MANUFACTURING COMPANY

Precision Brazes at Jet Speeds

ALLIS-CHALMERS
Induction HEATER





Each FACSIMILE Weldment of Vanes in Inlet Guide Assembly for J-57 Engine Completed in Seconds

Mr. Hi Frequency Is Ready and Able to Help You, Too

If your job is one of brazing, soldering, hardening, annealing, or heating, it will pay you to get all the facts on induction heating. Contact your A-C representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

UTILIZING an Allis-Chalmers 25-kw induction heater, and an *A-C designed work fixture,* Rheem has a brazing setup as streamlined as the jet planes they help build. Rheem's production speed is particularly significant in that it is accomplished in the face of stringent precision requirements, demanding accurately controlled localized heating. Close tolerances are a requirement. Yet the Allis-Chalmers induction heater, brazing at high speed, produces facsimile weldments — each as smooth and perfect as the next.

Specify A-C—Here's Why

The use of high frequency power makes Allis-Chalmers induction heating as much as seven times faster than conventional heating methods. Properly designed work handling equipment also speeds production. An automatic timer and other controls, standard on Allis-Chalmers units, promote precision operation. Allis-Chalmers extras — extensive laboratory facilities, unparalleled application experience, factory supervised installation — guarantee complete dependability . . . continuous service.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-5295

NOW!

A TWO-TON LIFT

WITH HUSKY 100-POUND AIR HOIST

New Keller Tool air hoist weighs 100 pounds . . . raises a 4000-pound load at 10 feet per minute. Hoist is strong and powerful enough to handle the 2-ton load with complete safety.

New 2-ton hoist is powered by high-torque, axial-piston compressed air motor for positive starts and stops. A centrifugally governed, fully mechanical brake prevents slippage. Length of lift is 8 feet. Hook-to-hook dimension is only 23½ inches.

Has all the outstanding features of the Keller Tool air hoist line:

Lightweight—easy to move and hang.

Variable Speed—from creep to maximum.

One-Hand Control—of lifting, lowering, spotting.

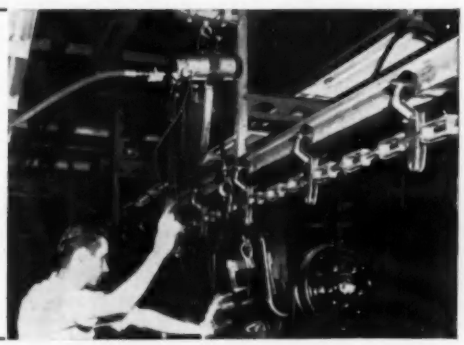
Safe in Heat or Dust—air motor doesn't spark . . . won't heat up.

Economical Operation—air consumption is low . . . requires little servicing or maintenance.

Operator Safety—powerful brake holds load regardless of air supply. An exclusive feature of the new two-ton hoist is a safety cable hole that provides extra safety for load and operator.

Keller Tool air hoists are available in lifting capacities of 150 . . . 300 . . . 500 . . . 1000 . . . 2000 . . . and *now* . . . 4000 pounds. Write for Bulletin 86.

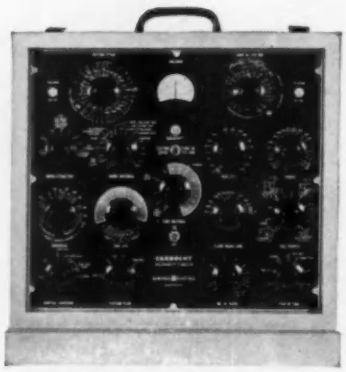
Keller Tool air hoist, keeping pace with assembly line conveyor, lifts rear axle assemblies onto conveyor hooks.



ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois



CARBOLOY.
MACHINABILITY COMPUTER

- Ends time-consuming tryout runs; saves valuable stock
- Shows you how to get maximum machine output at lowest cost

JUST DIAL IN KNOWN MACHINING DATA... SOLVE TOOL SETUP PROBLEMS IN SECONDS

The Carboloy Machinability Computer accurately predicts how your tools and machines will perform on any job. Faster than any other method of figuring job setups, it calculates the effect of 19 basic machining variables on machine performance, tool life, and output.

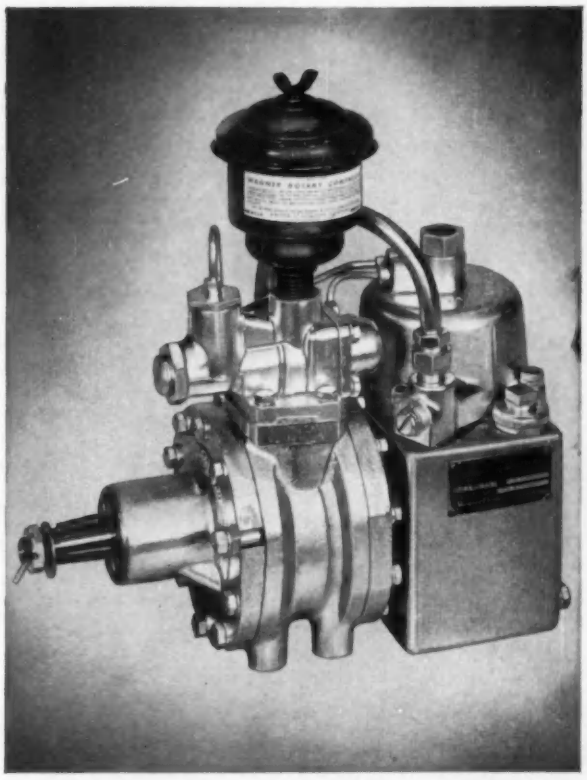
With this information, you can check the accuracy of existing setups, determine new machining standards, eliminate costly pilot runs. With the Computer, you can quickly see how to vary operating conditions to gain maximum efficiency from the cutting tool, the machine, and the operator. Simply set up the known machining variables on the Computer dials . . . then adjust the unknown variable until the Computer shows that the correct setting has been reached.

Hundreds of Carboloy Machinability Computers are now in use throughout industry . . . on jobs ranging from initial setups to trouble-shooting. The Computer is portable and rugged; priced at $495 (f.o.b. Detroit). For more information, or a demonstration in your plant, write: *Metallurgical Products Department of General Electric Company, 11151 E. 8 Mile Blvd., Detroit 32, Michigan.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

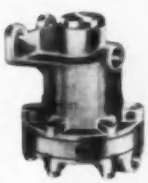
THE WAGNER ROTARY COMPRESSOR IS IMPORTANT IN MAKING WAGNER AIR BRAKES SAFE...EFFICIENT ...ECONOMICAL!



Actual field analysis shows that Wagner Rotary Air Compressors are safe—efficient—economical. They provide plenty of air for any emergency... have fast air recovery... and consistently keep service costs low because of exceptionally long life and easy, infrequent maintenance.

Wagner Rotary Air Compressors, available in either 9 or 12 C.F.M. capacity, air or water-cooled, are the heart of every Wagner Air Brake System. These Compressors are the only compressors that employ true rotary motion, with minimum friction loss. And because oil is separated and cooled before air is discharged, air temperature is reduced and formation of carbon, sludge and varnish in air lines is prevented.

It will pay you to include Wagner Air Brake Systems as standard equipment on the vehicles you manufacture. For complete information on Wagner "straight air" or "air-over-hydraulic" systems, send for your file copy of Wagner Bulletin KU-201.



WAGNER MOISTURE EJECTION VALVE

is one of many important Wagner Air Brake Components available to you. This fully automatic valve keeps air reservoir clean and dry.

Operating in the 15 to 20 p.s.i. air pressure range, it ejects moisture with each average brake application without causing a noticeable drop in tank pressure. May be mounted in any convenient location. No heating element is needed, as this valve cannot freeze in open (exhaust) position. Installation is quick and easy.

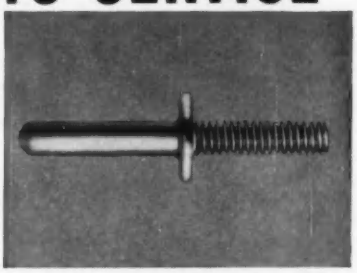
K57-9

Wagner Electric Corporation 6363 PLYMOUTH AVENUE • ST. LOUIS 14, MO., U. S. A.

LOCKHEED HYDRAULIC BRAKE PARTS and FLUID • NoRoL • CoMoX BRAKE LINING • AIR BRAKES • AIR HORNS • TACHOGRAPHS • ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES

National SPECIAL PRODUCTS SERVICE

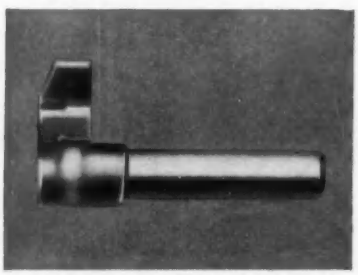
Precision parts with closely held tolerances and excellent surface finish, like this, can also be cold headed more economically and quickly.



Small parts like this can be produced, by cold heading, in huge hourly volume and at low unit cost.

Get strength at low cost with

COLD HEADED SPECIALS!



Intricate formations, like this, difficult or too costly by other methods, become routine production in the cold heading process.

You can make remarkable savings and get better parts in many cases by letting us duplicate and improve on parts you previously have had machined, cast or forged. It's possible with National cold heading!

What's more, we can quickly tell you whether cold heading would be an advantage for new designs.

Here's how National cold heading reduces unit costs . . . gives you better parts!

You save on production costs, because cold heading is fast . . . production rates of 50 to 300 pieces per minute are common. You don't pay for waste. Scrap loss in cold heading is negligible. You save on cost of extra operations, because cold heading eliminates them entirely or reduces their number. And most secondary operations, when required, can be performed automatically in mass production.

Cold heading assures strong, sound parts with good finish and excellent resistance to fatigue, shear and impact!

You're sure of strong parts because cold working *increases* the strength of steels and nonferrous metals. Subsequent heat-treatment or hardening can produce practically any degree of physical properties you desire.

You're sure of sound, clean parts because any defects, such as seams and inclusions, will open up in cold working . . . resulting in *automatic rejection.*

You're sure of superior fatigue, shear and impact resistance because cold heading produces continuous, unbroken flow lines in the grain of the metal . . . impossible to obtain by any other method.

You're sure of good surface finish, with a maximum of 50 micro-inch on cold headed surfaces. Cold heading won't cut or break the specially prepared, smooth, compressed and toughened surface of the rod.

National's cold heading specialists have many years of design and production experience. Combined with National's tremendous facilities for cold heading and secondary operations, this assures you of outstanding work and help in design and production of your parts.

Write for National's booklet, *Special Products.* To learn more about what National cold heading can do for you, send us your specifications or call in your nearest National representative.

THE NATIONAL SCREW & MFG. CO. • CLEVELAND 4, OHIO

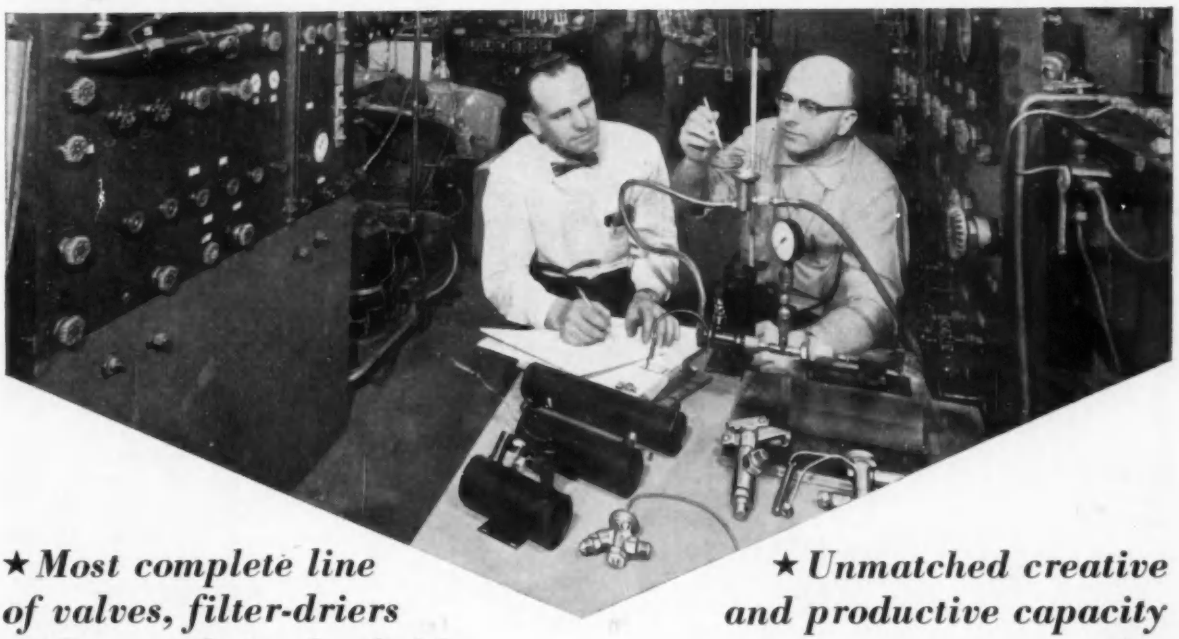
Pacific Coast: National Screw & Mfg. Co. of Cal. • 3423 South Garfield Ave., Los Angeles 22, Cal.

National PRODUCTS

Fasteners **Hodell Chains** **Chester Hoists**

Putting cool comfort on the road?

Depend on A-P for refrigeration controls



★ *Most complete line of valves, filter-driers and controls in the field*

YOU name the system: thermostatic by-pass . . . pressure actuated by-pass . . . or any other, we'll supply the thermostatic expansion valves, drier-receivers and liquid indicators in capacities, connections and operating characteristics to match.

A-P stands ready to assist you — as it has the pioneers in this field for more than 4 years — in all phases of automotive refrigeration control. Standard controls can be produced in any quantities. Special designs receive the immediate attention of the *combined* research and engineering facilities of Controls Company of America. More than 400 jobbers are conveniently located coast to coast for quick, competent maintenance service whenever desired.

It's only natural that leading automotive manufacturers depend on A-P. We'd like to help you, too. Write for new comprehensive bulletin.

★ *Unmatched creative and productive capacity at your service*

A-P Controls are standard equipment on air conditioners of major auto and truck manufacturers . . . as well as the various independents.

Chrysler Corp.
American Motors Corp.
Nash Motors Div.
Ford Motor Co.
Ford Div.
Ford Motor Co.
Mercury Div.
A.R.A. Mfg. Co.
Fort Worth, Texas
Capital Refrig. Co.
Dallas, Texas
Clardy Auto Air Conditioning Co.
Fort Worth, Texas
Climate Air Mfg. Co.
Tyler, Texas
Forston Mfg. Co.
Houston, Texas
Frigikar Corp.
Dallas, Texas
Frigiquip Corp.
Oklahoma City
National Gas
Denison, Texas
John E. Mitchell
Dallas, Texas
Tranter Mfg. Co.
Lansing, Michigan
American Mfg. Co.
Montgomery, Ala.

CONTROLS COMPANY OF AMERICA

Manufacturers of **A-P CONTROLS**

2415 No. 32nd STREET, MILWAUKEE 45, WISCONSIN

Controls That Make Modern Living Possible

BAKER announces an ALL NEW PNEUMATIC-TIRED FORK TRUCK

Trail Axle
Double-yoke construction for extra strength. Longitudinal mounting in jumbo rubber blocks to provide lateral oscillation and absorb ground shocks.
Power Unit
Heavy-duty industrial gas engine with extra stamina for continuous rugged service. Features maximum fuel economy—minimum maintenance.
BAKER
Power Steering
Standard at no extra cost. Effortless full-time power steering means less operator fatigue, greater safety and more work per day.
Lift and Tilt Controls
Conveniently located and easily manipulated levers for positive control of hydraulically-operated hoist and tilt motions.
Drive Axle & Transmission
Rugged Timken industrial truck axle and heavy-duty transmission, with two speeds, forward and reverse.
Single or Dual Wheels
Large pneumatic tires on drive wheels, with deep treads for maximum traction. Dual wheels available for extra heavy duty, better flotation and added stability.
Brakes—Hydraulic self-energizing, full-floating type—in drive wheels. Self energizing in both forward and reverse. Duo-grip, two-shoe independent parking brake on transmission shaft.

This Baker FGF-40, 4,000-lb. YARDLOADER, first in the new line of Baker pneumatic-tired gas fork trucks, has many new design features for greater maneuverability and more dependable performance. It is *fast*—top speed with load, 8.6 mph. It is *compact*—only 48 inch wheelbase, and minimum overhang—*and only 79 inch turning radius.* Low center of gravity makes this possible without sacrificing stability.

Absence of cowl provides maximum visibility. Power steering and many other driver conveniences make it one of the easiest handling fork trucks—and one of the safest. Full 130-inch lift, with single or dual cylinder. Truck-loading mast available with 110-inch lift and 71-inch overall height . . . For complete information ask for Bulletin 1382.

Baker® industrial trucks

THE BAKER-RAULANG COMPANY
1203 WEST 80th STREET • CLEVELAND 2, OHIO
A Subsidiary of Otis Elevator Company

Otis 7G1

NEED A *SPECIAL* RUBBER PART TO LICK A TOUGH PROBLEM?

PHOENIX 4-STEP SERVICE

assures a better end product

Compounding special rubber to meet specific product requirements has been a Phoenix specialty for over 25 years.

Phoenix 4-Step Service can help you use natural or synthetic rubber in designing a better and often cheaper end product:

We will (1) analyze your problem, (2) assist in designing the rubber component, (3) compound and test the most suitable rubber and (4) manufacture the part with traditional Phoenix craftsmanship.

A Phoenix representative will gladly show you how Phoenix 4-Step Service can help you lick a tough product problem, as it did in case of the flexible coupling below.

THE CASE OF THE FLEXIBLE COUPLING

A flexible coupling component of an automobile window and seat assembly called for rubber bonded to nylon. The problem was to retain this bond under extreme torque running as high as 180°. Additionally, the rubber must not rupture, must be resilient and flexible to all temperatures and be resistant to oil. These characteristics must be retained for the life of the car.

Phoenix compounded a special synthetic rubber with all of the properties required and successfully bonded it to nylon. The component has surpassed all expectations, thanks to Phoenix skills with rubber.

Leading Manufacturers of Custom Molded Mechanical Rubber

PHOENIX

RUBBER PRODUCTS DIVISION

PHOENIX MANUFACTURING COMPANY

JOLIET, ILL. • FOUNDED 1862

Integrated Manufacturing Facilities: RUBBER PRODUCTS DIVISION, OIL AND GREASE SEAL DIVISION, FLANGE AND FORGING DIVISION, STEEL MILL DIVISION, HORSESHOE PRODUCTS DIVISION

7G1

Always, at **SKF**, you will receive
unbiased advice

because

– All four basic types of anti-friction bearings are available from **SKF**.

because

– They offer an extraordinarily wide range of sizes and combinations to meet virtually any requirement.

because

– Their long experience in the widest variety of bearing applications is your assurance of receiving sound recommendations.

because

– Thousands of manufacturers have been using the **SKF** Bearing Advisory Service for many years – always with good results. This dependable service is available to you, too. 7754

SKF

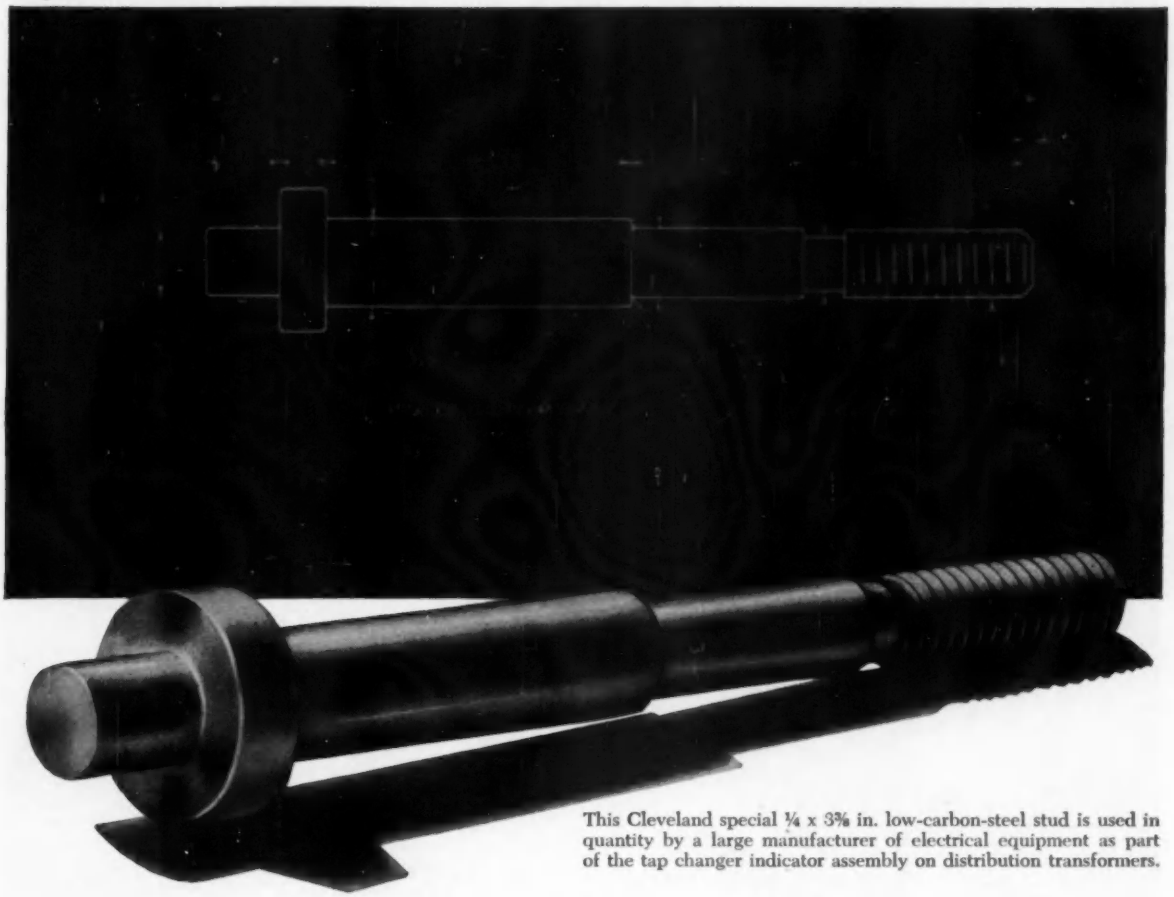
EVERY TYPE—EVERY USE

- *Ball Bearings*
- *Cylindrical Roller Bearings*
- *Spherical Roller Bearings*
- *Tapered Roller Bearings* ("Tyson")

* Reg. U.S. Pat. Off. Tyson Bearing Corporation

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

CLEVELAND SPECIAL HEADED AND THREADED PRODUCTS



This Cleveland special ¼ x 3⅝ in. low-carbon-steel stud is used in quantity by a large manufacturer of electrical equipment as part of the tap changer indicator assembly on distribution transformers.

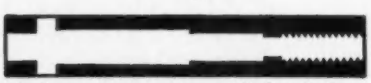
Cost of special collar stud is cut 20% by Cleveland's cold forming techniques

The famous Kaufman Double Extrusion Process which turns out millions of Cleveland precision cap screws yearly is highly adaptable to low-cost production of your fastener-type specials.

The tap changer stud pictured above is typical. Used by a well-known electrical equipment manufacturer, it was previously cut from bar stock. The special head, double shoulders, and groove above the threads meant numerous machining operations and considerable scrap.

Cleveland now cold forms this special stud at 20% less cost to the customer, while holding the specified .005 in. tolerance. And the part is stronger. In the head, threads and fillets, grain flow is symmetrical and unbroken. In addition, the forging action of the Kaufman process toughens surface metal while leaving the core ductile. Both fatigue resistance and tensile strength are thus increased.

We are regularly cold forming close-tolerance specials—many with unusual or extreme upsets—in large quantities. So whether your part is simple or complex, it will pay you to check with Cleveland, particularly at the design stage. There is an excellent chance that through cold forming we can cut the cost and improve the physical properties of the part you have in mind.



Black area represents metal that had to be cut away when stud was produced by machining. In the Cleveland cold forming process almost all the metal in the working slug is present in the finished part. The customer saves the difference.

Write for a copy of our folder "Specials by Specialists"

THE CLEVELAND CAP SCREW COMPANY
4444-10 Lee Road, Cleveland 28, Ohio

service is available to you, too. 7794

Quantity PRODUCTION *of* GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY

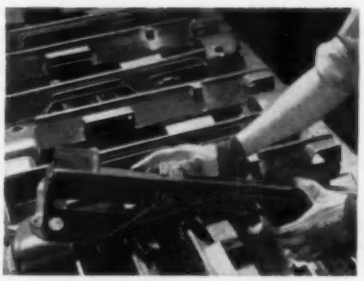
FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS

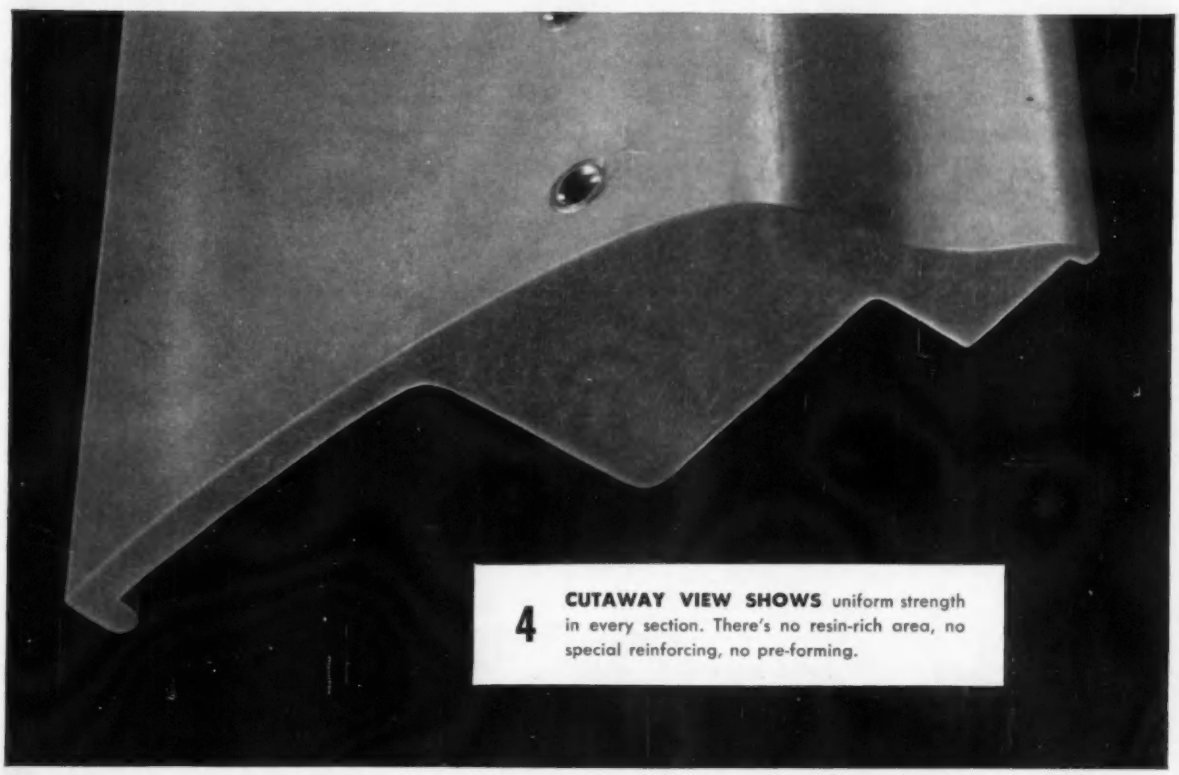
CHATTANOOGA 2, TENNESSEE

1 This premix consists of reinforcing material, such as fiber glass or sisal, thoroughly mixed with polyester resin containing Dow Styrene.

2 The premix molding compound flows evenly to each and every section of the closed die as it is compressed under heat and pressure.



3 After a very short cycle, the finished premix molding is removed from the die. It is now ready for immediate assembly or shipment.



4 **CUTAWAY VIEW SHOWS** uniform strength in every section. There's no resin-rich area, no special reinforcing, no pre-forming.

For lower bids: premix moldings

For uniform strength: polyester resin with Dow Styrene

Many complicated parts—especially parts with varying wall thicknesses—are now made better, at lower cost, by premix molding. There are no resin-rich areas. Strength is uniformly distributed. Pre-forming is eliminated. And holes and nozzles can be molded in a part, eliminating punching and drilling operations.

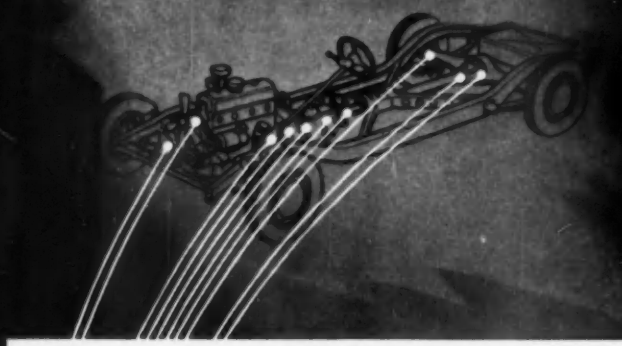
Leaders of the automotive and appliance industries have proved the benefits of premix moldings for specific parts. Many innovations are now on the drawing boards.

The product shown is an example of the many now being made by premix molding using Dow Styrene. For technical assistance on Dow Styrene, write THE DOW CHEMICAL COMPANY, Midland, Michigan – Plastics Sales Department PL1886G.

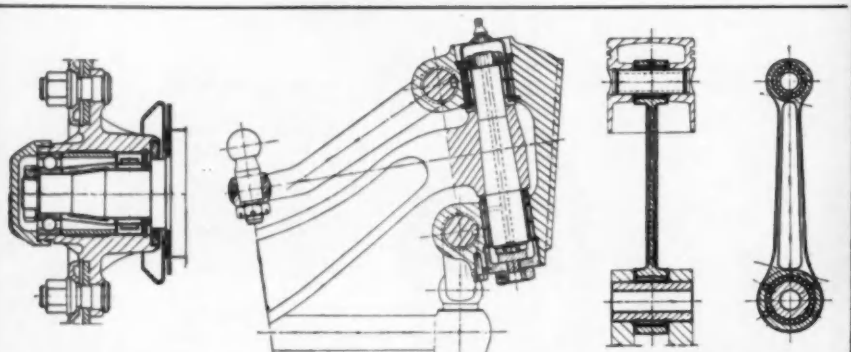
Photographs through the courtesy of Fabricon Products, River Rouge, Michigan

YOU CAN DEPEND ON DOW

Oldest in age
Still in the lead



loose needles | needle cartridges | complete bearings

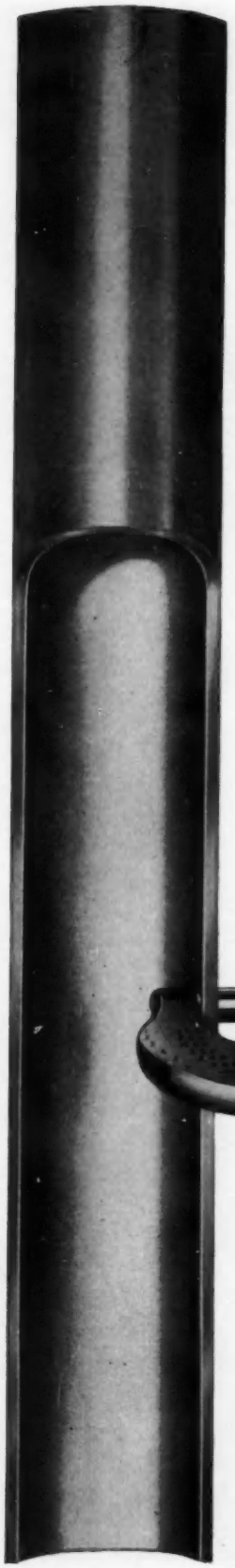


WHEEL HUB | KING PIN (FRONT AXLE) | CONNECTING ROD

NADELLA
NEEDLE BEARINGS

133 à 137 BOUL. NATIONAL - RUEIL-MALMAISON (S.-&-O.) FRANCE

ACTA

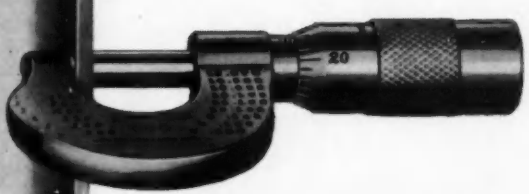


CYLINDER TUBING

..."mirror-finished" by Standard

Standard "mirror-finished" cylinder tubing is full-finished to use without further sizing or finishing for such applications as *automobile shock absorbers, power steering* and *hydraulic pumps.* When it comes to punishment, it can really take it. Every inch of this rugged tubing measures up to exacting specifications in cylinder finish . . . in ID tolerances as close as .001" . . . in extreme uniformity of wall thickness and concentricity . . . in internal pressure resistance, *tested to shocks up to 9000 p.s.i.* Cylinder sizes to 3" OD x .165" wall. For full information on Standard's complete range of products, plant facilities and engineering assistance send for *free* folder below.

- **Welded Stainless Tubing and Pipe.**
- **Boiler and Heat Exchanger.**
- **Welded Carbon Steel mechanical.**
- **Exclusive rigidized pattern.**
- **Special Shapes**



Shock absorber with metal-to-metal plunger in cylinder tube held to .001" ID tolerance. "Mirror-finish", concentricity and precision tolerance makes Standard cylinder-grade tubing usable *as is* for hydraulic and other cylinders.

Free 8-page folder on all Standard products. Write to address below.

STANDARD

THE STANDARD TUBE COMPANY

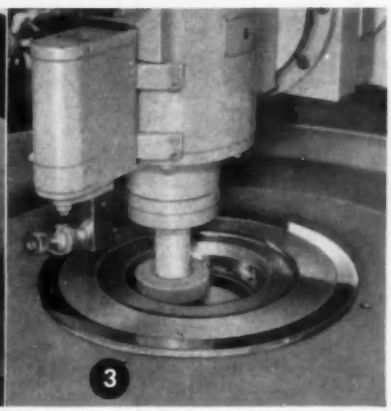
24400 PLYMOUTH ROAD • DETROIT 39, MICHIGAN

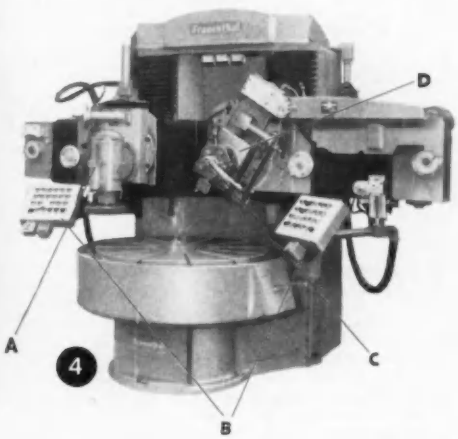
Welded stainless tubing and pipe • Welded carbon steel mechanical • Boiler and Heat Exchanger • Exclusive rigidized patterns • Special Shapes • Steel Tubing—Sizes: ¼" OD to 5¼" OD —.028 to .260 wall • Stainless—Sizes: ¼" OD to 4" OD—.020 to .154 wall.

One set-up...

...and you can turn, bore and finish grind a single workpiece to close tolerances on the NEW FRAUENTHAL SERIES 3100 TURNING AND GRINDING MACHINE.

With it, you obtain unusual machining accuracies that assure concentricity of related surfaces.





WITH the new Frauenthal Series 3100 precision turning and grinding machine you get accuracies previously considered impractical.

Designed to meet the most exacting requirements of jet engine manufacture as well as other precision applications, the Series 3100 machine is new from the ground up. Its unique design presents a host of opportunities to put large and extremely close-tolerance jobs on a mass production basis. And the 3100 offers exceptional capacity for precision turning and precision grinding.

Check these salient features

- Ultra-precision work table bearings
- Hydraulically actuated turning slide
- Hydraulically actuated grinding slide
- Super precision grinding spindle
- Conveniently located controls and safety switches

. . . and this optional equipment

- Hydraulic tracer control
- Electronic table surface speed control
- Hydraulic wheel dressers for varied applications

Frauenthal Division

THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN

...about the pictures

PHOTO 1 shows how the operator uses a Series 3100 machine to finish bore the inside diameters preparatory to grinding operations.

PHOTO 2 shows the machine's contouring attachments being used to face the top surfaces of a workpiece.

PHOTO 3 shows how the machine performs close-tolerance finish grinding of the workpiece's top surfaces and inside diameter, to assure concentricity and squareness of related surfaces.

PHOTO 4 illustrates (a) grinding spindle with graduate swivel mounting, (b) push-button control panel, (c) five-station tool turret, (d) hydraulic actuated turning slide; hydraulic tracer control optional.

May we help you?

If you'd like further information on how the Series 3100 precision turning and grinding machine can give you production and/or tool room advantages — our engineers are at your service. Write for informative bulletin No. 301.

Seating Dollars Buy More at "Milsco"

- ✓ Complete engineering facilities
- ✓ Large, modern factory
- ✓ Field-tested seating for
- ✓ your satisfaction

NOW! The MILSCO "THRIFT-KING" SEAT IN 2 POPULAR SIZES AND STYLES

"THRIFT KING"

The Milsco "Thrift-King" seat is the nation's greatest seating value, and the demand has spread to the trucking industry, lift trucks, power mowers and many types of mobile equipment.

The strong welded angle iron frame in the "Thrift-King" has stood the test, and will add "sales-appeal" to your product.

MILSCO F-1105

Complete with folding backrest and padded with bonded foam rubber. Covered with brown Spanish grain Naugahyde. Fore and aft adjustment. Frame brown.

Front to rear . . . 19¼"
Left to right . . . 15⅜"

MILSCO F-1130

Complete with folding backrest and padded with bonded foam rubber. Covered with black imitation leather. Frame black. Center bar for easy attaching. Less fore and aft adjustment.

Front to rear . . . 19"
Left to right . . . 17⅜"

NOTE: "Thrift-King" seats can also be had with stationary backrest.

Write today for complete details.

AMERICA'S most versatile manufacturer of cushion seating . . .

Milsco MILWAUKEE

2730 No. 33rd ST., MILWAUKEE 45, WIS.

DESIGNERS for COMPARATIVE AND ULTIMATE STRENGTH TESTS, ETC

INSPECTION of PARTS AND ASSEMBLIES, ETC

LABORATORY TESTING of SCREWS, SOCKETS, TAPS, LOCK NUTS, DRIVING BITS, HAIR SPRINGS, ETC.

PRODUCTION QUALITY CONTROL for DELICATE OPERATIONS, ASSEMBLY OF FRAGILE MECHANISMS OR INSTRUMENTS; FOR FASTENERS IN PLASTICS AND LIGHT METALS.

Torque Testing FIXTURE

A universal fixture with 1000 uses. Holds driver in accurate alignment; in instrument bearings. Provides rapid engagement with test sample...torque is applied and measured with Sturtevant Torque Wrench.

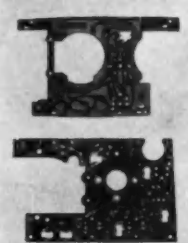
Model TTF¼ Capacity 0-200 in. lbs.
Model TTF½ Capacity 0-150 ft. lbs.

Write for Bulletin TF

P.A. STURTEVANT CO. ADDISON QUALITY ILLINOIS

AUTOMOTIVE MANUFACTURERS: Have you investigated PRINTED WIRING possibilities lately?

Applications Possessing High Density of Wire and Component Connections may Benefit by Utilization of PRINTED CIRCUIT PANELS

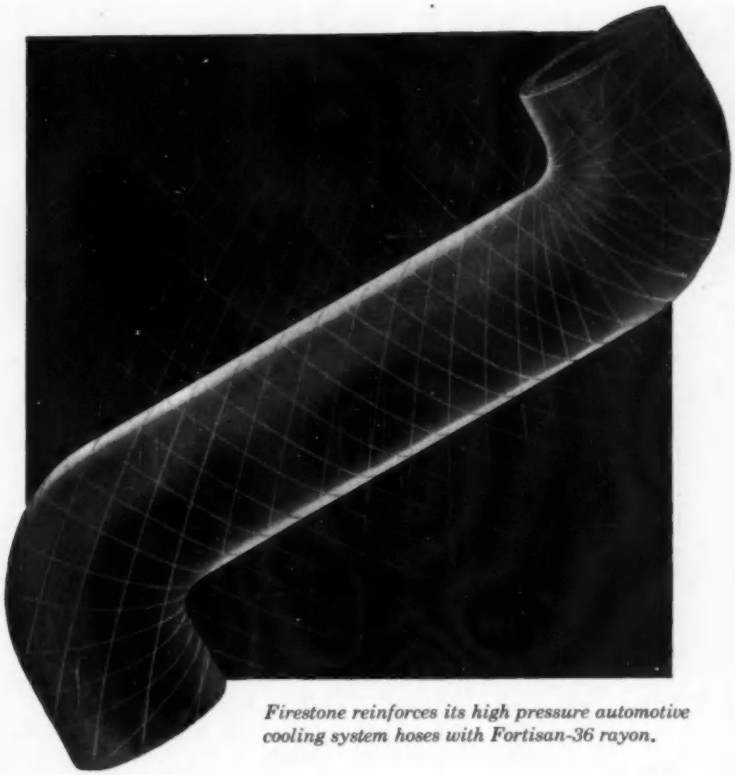


The printed circuit technique offers possibilities for advanced product design and manufacture through:

- *Mechanized assemblies*
- *Uniform lead dress*
- *Unit replacement*
- *Multiple soldering*
- *Simplification and integration of components*

FOR FULL INFORMATION ON HOW TO DESIGN FOR PRINTED CIRCUIT PANELS, WRITE ON COMPANY LETTERHEAD FOR THE SECOND EDITION OF THE HANDBOOK "UTILIZATION OF PREFABRICATED WIRING"

METHODE Manufacturing Corp.
2021 West Churchill Street • Chicago 47, Illinois



Firestone reinforces its high pressure automotive cooling system hoses with Fortisan-36 rayon.

We want your fiber headaches

ACETATE

Easy to work with.
High electrical resistivity.
High loft.
Low cost.
Good resistance to microbiological attack.
Low specific gravity.
Thermoplastic.
Integral color when needed.

FORTISAN RAYON YARNS

Remarkable dimensional stability.
High tensile strength.
Great resistance to stretch despite load and weather.
High strength to weight ratio.

ARNEL TRIACETATE

High melting point (572 F.).
Low heat degradation.
High electrical resistivity.
Low moisture regain and water absorptivity.
High microbiological immunity.
Low cost.

Do you want V-belts that won't shrink in storage and have very low stretch in use? Low cost battings for filters, cushioning and insulation? Electrical wire covering with low heat degradation?

These are among the many things Celanese Industrial Fibers do better.

Fortisan rayon and Fortisan-36 rayon, Arnel triacetate, acetate—all are engineered to perform specific jobs outstandingly—at competitive prices. That is why we say—we want your fiber headaches—stringent specifications at a price. For that's where Celanese fibers shine.

Important plus: we supply not only our fibers but our skills—from development in our plants to technical assistance in yours. Celanese Corporation of America, Industrial Sales Department, Textile Division, Charlotte, North Carolina.

Celanese®

District Offices

180 Madison Ave., New York 16, N. Y.
22 W. Madison St., Chicago 2, Ill.

Export

Amcel Co., Inc. and Pan Amcel Co., Inc., 180 Madison Ave., New York 16, N. Y.

In Canada

Chemcell, Canadian Chemical Cellulose Co., Ltd., 2035 Guy St., Montreal, P. Q.

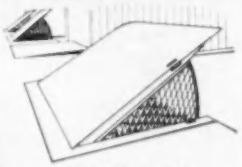
Celanese Fibers for Industry

FORTISAN® RAYON • FORTISAN®-36 RAYON • ARNEL® TRIACETATE • RESILUCEL™ • ACETATE • VISCOSE RAYON

LOADING DOCK PROBLEMS?

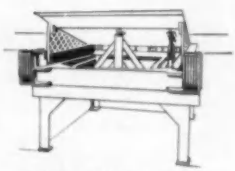
3 easy ways to solve them —and most economically, too!

RITE • HITE mechanical loading ramps



RECESSED RAMPS
Two standard, 60" x 60" and 72" x 72". Two flush-type, 72" x 72" and 96" x 72".

SELF-CONTAINED RAMP
For non-permanent installations. 72" x 72".



TRUCK-ACTUATED RAMPS
Two models, recessed and self contained, 96" x 72".

10-ton capacity

Practically no maintenance! Rite-Hite *precision counterbalanced* design eliminates troublesome cylinders, pumps, motors, starters, piping, valves, wiring, gears, cables. Rite-Hites are not affected by dirt, debris, extreme heat or cold. Easy to install—furnished complete, no "extras" to buy. All-welded heavy steel construction. You can be *sure*, when it's a Rite-Hite, it's right. Get full details—write Dept. G-57.

RITE-HITE DIVISION

LOOMIS MACHINE COMPANY
133 EAST FOURTH STREET, CLARE, MICHIGAN

HUNDREDS OF PLANTS SOLVE PROBLEM OF SKIN INJURY

"Kerodex" Offers Truly Effective Protection Against Skin Irritants

Irritation from epoxy resins and amine hardeners, "dope," solvents, cutting oils, and many other highly damaging substances is no longer a problem when "Kerodex" prevents contact with the skin. Hundreds of plants find "Kerodex" successful where other barrier creams fail.

"Kerodex"® spreads on easily and acts like a glove that is invisible yet strong and flexible. Does not smear. Does not affect materials handled nor is it affected by them. Available in two types. For full information write to Ayerst Laboratories, 22 East 40th Street, New York 16, N. Y. 5670

VELLUMOID

Install VELLUMOID Gaskets with Confidence!

More mechanics are specifying Vellumoid for trouble-free superior performance. A wide selection of Vellumoid gaskets that match or exceed original equipment specifications are available.

Ask your jobber.

THE VELLUMOID COMPANY
Worcester, Massachusetts

DYKEM STEEL BLUE®

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2301L North 11th St. • St. Louis 6, Mo.

CUT SCRAPER TIME

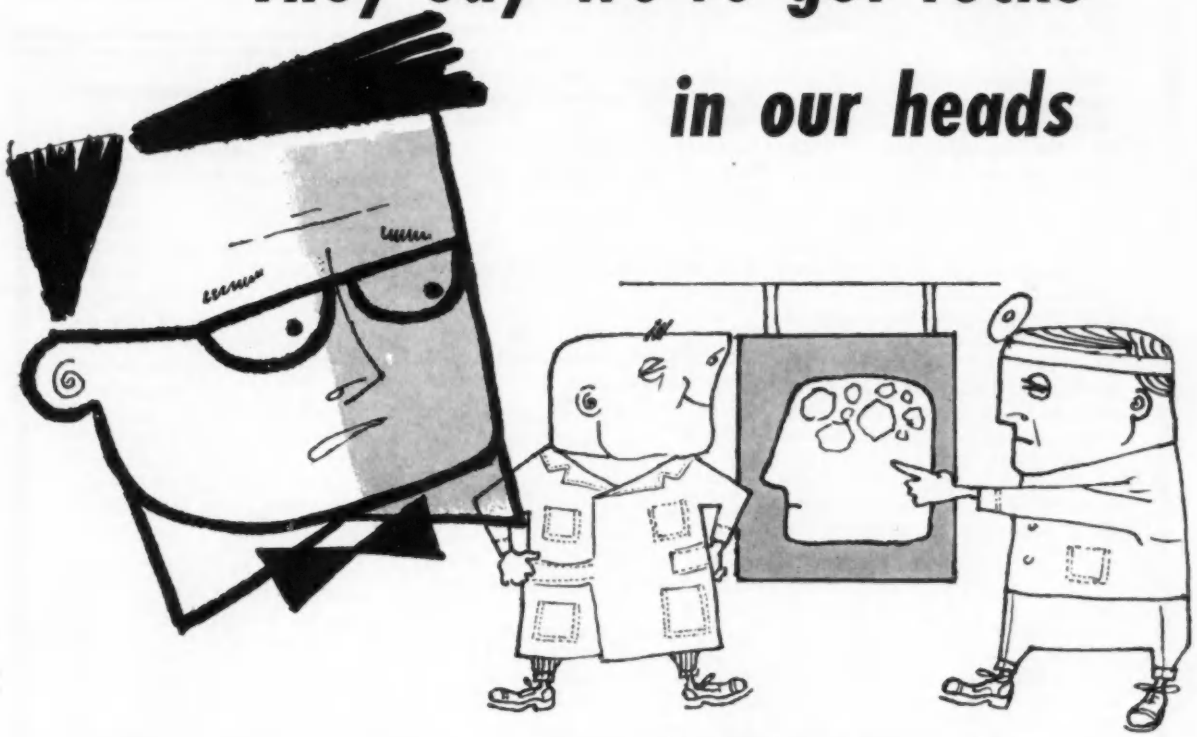
END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2301L NORTH 11TH ST., ST. LOUIS 6, MO.

AUTOMOTIVE INDUSTRIES is read by general executives, production men, engineers, purchasing agents and others whose o.k. means orders for those who sell to The World's Largest Manufacturing Industry.

They say we've got rocks in our heads



—and it's true!

We really don't mind this sort of talk. It's our business to have the types of "rocks" on our minds that are saving millions of dollars in the finishing of manufactured parts.

Roto-Finish people have studied abrasive chips and compounds since the day they pioneered the idea of precision barrel finishing. The development of new and better media for specific finishing problems has made Roto-Finish the leader in mechanical finishing. Years of research and experience in barrel finishing techniques give Roto-Finish the "know-how" to recommend the right media to do the job you want done.

If you're not satisfied with your finishing production, look to Roto-Finish for the answer. Simply send samples of your unfinished parts, a finished part, a description of your production requirements and a list of the equipment you have available. We'll prove that you can save with Roto-Finish and we'll guarantee the same results in your plant that are achieved in sample processing.

SEND FOR FREE
TECHNICAL DATA FOLDER
ON ROTO-FINISH PROCESSES

Roto-Finish
COMPANY
3713 Milham Road
Kalamazoo, Mich.

ROTO FINISH

Phone:
Fireside 3-5578

FOREIGN REPRESENTATIVES: CANADA — Toronto — Canadian Hansen & Van Winkle Co., Ltd., Cor. Silver and Morrow Aves. ENGLAND — Mark Road — Hemel Hempstead — Hertfordshire — Roto-Finish Ltd. AUSTRALIA — Cheltenham, 89 Tulip St., A. Flavell Ltd. HOLLAND — BELGIUM — LUXEMBURG — Delft, Holland — N.V. Roto-Finish Maatschappij Rotterdamseweg 370A ● AUSTRIA, GERMANY, SWITZERLAND, NORWAY, SWEDEN Frankfort a.M.—Metallgesellschaft A.G., Germany — Reuterweg 14 ● ITALY — Milan — Societa Roto-Finish a R.L. — Sestos S. Giovanni — Viale E. Marelli 31 ● FRANCE—Paris Societe Roto-Finish, 40-42 rue Chance Milly—Clichy, (Seine) ● BRAZIL — Rio de Janeiro — Commercial E. Industrial de Formos Werco, Ltds. rua General Gurjao, 326 ● SPAIN — Barcelona — Instituto Electroquimico, S.A. — Corcega 59.

Index to

This Advertisers' Index is published as a convenience, care will be taken to index correctly. No allow-

A

AC Spark Plug Electronics Div. 95
AMP Inc. 115
Accurate Spring Mfg. Co. 112
Aeroquip Corp. 213
Aetna Ball & Roller Bearing Co. .. 149
Ajax Manufacturing Co. 135
Albion Malleable Iron Co. 28
Alemite Div. of Stewart-Warner .. 219
Allis-Chalmers (Industrial Equipment Div.) 246
American Brakeblok Div. 221
American Broach & Machine Div. Sundstrand Machine Tool Co. 158-159
American Chain & Cable Co. 232
American Chemical Paint Co. 125
Apex Machine & Tool Co. 176
Armstrong Cork Co. 44
Athenia Steel 206
Automatic Spring Coiling Co. 168
Automotive & Aircraft Div. 232
Ayerst Laboratories 264

B

Babcock & Wilcox Co. 241
Baker Bros., Inc. 104
Baker-Raulang Co. 252
Baush-Machine Tool Co. 252
Bendix Aviation Corp.
Products Div. 30
Scintilla Div. 97
Zenith Carburetor Div. 47
Besly-Welles Corp. 243
Bliss Co., E. W. 209
Borg & Beck Div. Borg-Warner Corp. 142
Borg Warner Corp. 24-25
Bridgeport Brass Co. 228
Buckeye Tools Corp. 122
Bundy Tubing Co. 204-205
Burg Tool Mfg. Co. 4
Burton Auto Spring Corp. 12

C

Carr Fastener Co., Div. United-Carr Fastener Corp. 220
Celanese Corp. of Amer. 263
Chambersburg Engineering Co. .. 222
Chicago Rivet & Machine Co. 120
Clark Bros. Co. 207
Clark Equipment Co. 43
Clearing Machine Corp. 140-141
Cleveland Cap Screw Co. 255
Columbia-Geneva Steel Div. 151
Continental Motors Corp. 198
Continental Screw Co. 88
Controls Co. of Amer. 251
Coolidge Corp. 156
Copperweld Steel Co., Ohio Seamless Tube Div. 78
Crucible Steel Co. of Amer. 203
Curtiss-Wright Corp. 190-191

D

Dana Corp. (Spicer) 136-137
Davis & Thompson Co. 148
Denison Engineering Div. 13
Doehler-Jarvis Div. National Lead Co. 188-189
Douglas Aircraft Co. 210
Dow Chemical Co. (Plastics Sales Dept.) 257
du Pont de Nemours & Co., (Nylon Tirecord) 244
Durez Plastics Div. 126
Dykem Co. 264

E

Eaton Mfg. Co., Dynamatic Div. .. 79
Elastic Stop Nut Corp. 77
Electro Metallurgical Co. 101
Enjay Co. 119
Erie Foundry Co. 212
Evans Products Co. 240
Ex-Cell-O Corp. 99

F

Fairfield Mfg. Co. 106
Farval Corp. 131
Fawick Brake Div. 201
Federal Machine & Welder Co. .. 235
Federal-Mogul-Bower Bearings, Inc.
Bearings Co. of Amer. Div. 195
Federal-Mogul Div. 45
National Seal Div. 18
Federal Products Corp. 16-17
Foote-Burt Co. 46
Formsprag Co. 208
Fostoria Pressed Steel Corp. 218
Fram Corp. 105
Frauenthal Div. Kaydon Engineering Corp. 260-261
Fuller Mfg. Co. 181

G

Gardner-Denver Co. (Keller Tool Div.) 247
Gear Grinding Machine Co. 216
General Electric Co. .. 109-110, 163, 248
Gillett & Eaton Inc. 237
Gisholt Machine Co. 20-21
Gits Brothers Mfg. Co. 229
Globe-Union, Inc. 231
Goshen Rubber Co., Inc. 154

H

Hagnifin Corp. 19
Hanson Mfg. Co. 111
Harrington & King Perforating Co. 190
Harrison Radiator Div. 225
Hassall Inc., John 162
Heald Machine Co. ..... 2nd Cover
Holley Carburetor Co. 165
Hyatt Bearings Div. 5

I

Industrial Metal Protectives, Inc. .. 164
Ingersoll-Rand 174-175

J

Johnson Products, Inc. 124

K

Kaiser Aluminum & Chemical Sales, Inc 6-7
Kelsey-Hayes Co. 224
Kent-Owens Machine Co. 127
Keuffel & Esser Co. 180

L

Lamb Electric Co. 130
Le Blond Machine Tool Co., R. K. 128-129
Linde Air Products Co. 10
Linear Inc. 193
Lipe-Rollway Corp. 108
Loomis Machine Co. 264
Luber-Finer Inc. 194

M

McKay Machine Co. 153
McLouth Steel Corp. 234
Metallurgical Products Dept. General Electric Co. 248
Methode Mfg. Corp. 262
Midland Steel Products Co. 114
Miller Fluid Power Div. 8
Milsco Mfg. Co. 262
Motch & Merryweather Machinery Co. 42
Muskegon Piston Ring Co. 123

N

Nadella 258
National Broach & Machine Co. .. 29
National Lead Co. (Doehler-Jarvis Div.) 188-189
National Malleable & Steel Castings Co. 227
National Screw & Mfg. Co. 250
National Standard Co. 206
National Tube Div. 151
Niagara Machine & Tool Works .. 22-23

O

Oakite Products, Inc. 200
Ohio Seamless Tube Div. of Copperweld Steel Co. 78
Olin Mathieson Chemical Corp .. 211
Olsen Testing Machine Co., Tinius 138
Osborn Mfg. Co. 242

P

Palnut Co. 186
Parker Rust Proof Co. 223
Pesco Products Div. 25
Peters-Dalton, Inc. 187
Phoenix Mfg. Co. (Rubber Products Div.) 253
Pioneer Aluminum Inc. 179

R

Ramsey Corp. 199

Advertisers

and not as part of the advertising contract. Every once will be made for errors or failure to insert.

Raybestos-Manhattan Inc.
Adhesives Dept. 171
Equipment Sales Div. 268
Plastic Products Div. 226
Reliance Electric & Engineering Co. 169
Republic Steel Corp 184-185
Reynolds Wire 206
Reynolds Metals Co. 143-144
Rigidized Metals Corp 157
Rochester Products Div. 121
Rockford Clutch Div. 170
Rogers Corp. 134
Ross Gear & Tool Co. 9
Roto Finish Co. 265
Russell, Burdsall & Ward
Bolt & Nut Co. 245
Ryerson & Son, Inc., Jos. T. 32

S

SKF Industries, Inc. 254
S-P Manufacturing Corp. 116
Saginaw Steering Gear Div. 217
Schrader's Son, A. 26-27
Sealed Power Corp. 113
Sheffield Corp. 267
Shuford-Mills, Inc. 150
Southern Screw Co. 145
Stackpole Carbon Co. 152
Standard Pressed Steel Co.
Locknut Div. 2
Unbrako Socket Screw Div. 117
Standard Tube Co. 259
Stewart-Warner
Alemite Div. 219
Instruments & Gauges 238
Sturtevant Co., P. A. 262
Sun Oil Co. 11
Sundstrand Machine Tool Co.
Amer. Broach & Machine Div. 158-159
Machine Tool Div. 160-161
Superior Steel Corp. 107
Synchro-Start Products Inc. 267

T

Taylor-Winfield Corp. 182
Thompson Products, Inc
Valve Div. 183
Timken Detroit Brake Div. 215
Timken Roller Bearing Co. Back Cover
Tinnerman Products, Inc. 236
Tomkins-Johnson Co. 196-197
Torrington Co. 103
Transue & Williams 233
Tru-Seal Div. Flick Reedy Corp. ... 145
Tubular Products Div. Babcock &
Wilcox Co. 241
Tung Sol Electric, Inc. 192

U

United-Carr Fastener Corp. 220
United States Rubber Co. 91
United States Steel Corp. 151, 173

V

Vanadium Corp. of Amer. 214
Vellumoid Co. 264
Verson Allsteel Press Co. 230

W

Wagner Electric Corp. 249
Wagner Litho Machinery 206
Waukesha Motor Co. 1
Wean Equipment Corp. 239
Webb Co., Jervis B. 177-178
Westinghouse Electric Corp.
Cypak 202
Industrial Heating Div. 14-15
Sturtevant Div. 166-167
Void O Timer 146-147
Wheland Co. 256
Wooster Div. 24
Worcester Wire Works 206
World Bestos 172

Y

Yale & Towne Mfg. Co. 132-133
Yates-American 118
Yoder Co. 194
Youngstown Sheet & Tube Co. 155

Z

Zollner Corp. ..... 3rd Cover

SPEED SENSITIVE SWITCHES

1, 2 and 3 ELEMENT

UNDERSPEED . . . One S.P.D.T. switch to trip at speeds as low as 400 RPM. Maximum operating speed 5,000 RPM.

OVERSPEED . . . One S.P.D.T. switch to trip at speeds between 500 and 6,000 RPM.

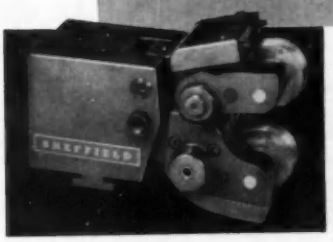
OVER AND UNDERSPEED . . . Two S.P.D.T. switches to trip at two different speeds between 500 and 6,000 RPM.

OVER—INTERMEDIATE AND UNDERSPEED . . . Three S.P.D.T. switches to trip at three different speeds between 1,200 and 6,000 RPM.

Speeds above or below those listed above must be referred to our Engineering Department for special consideration. Request Bulletin 504 describing our Speed Sensitive Switches.

SYNCHRO-START PRODUCTS, INC.
8151 N. RIDGEWAY AVE., SKOKIE, ILLINOIS
Automatic Engine Control Sets • Special Control Panels • Safety Alarm Sets • D.C. Solenoids • Heavy Duty Relays

SHEFFIELD PRECISION-ROL
For BROWN & SHARPE NO. 2G AUTOMATIC
- Assures Higher Production
- Larger Capacity
- More Accurate Threads



- One adjustment for pitch diameter
- One adjustment for matching
- No machine alterations
- No special cams
- Either front or back slide

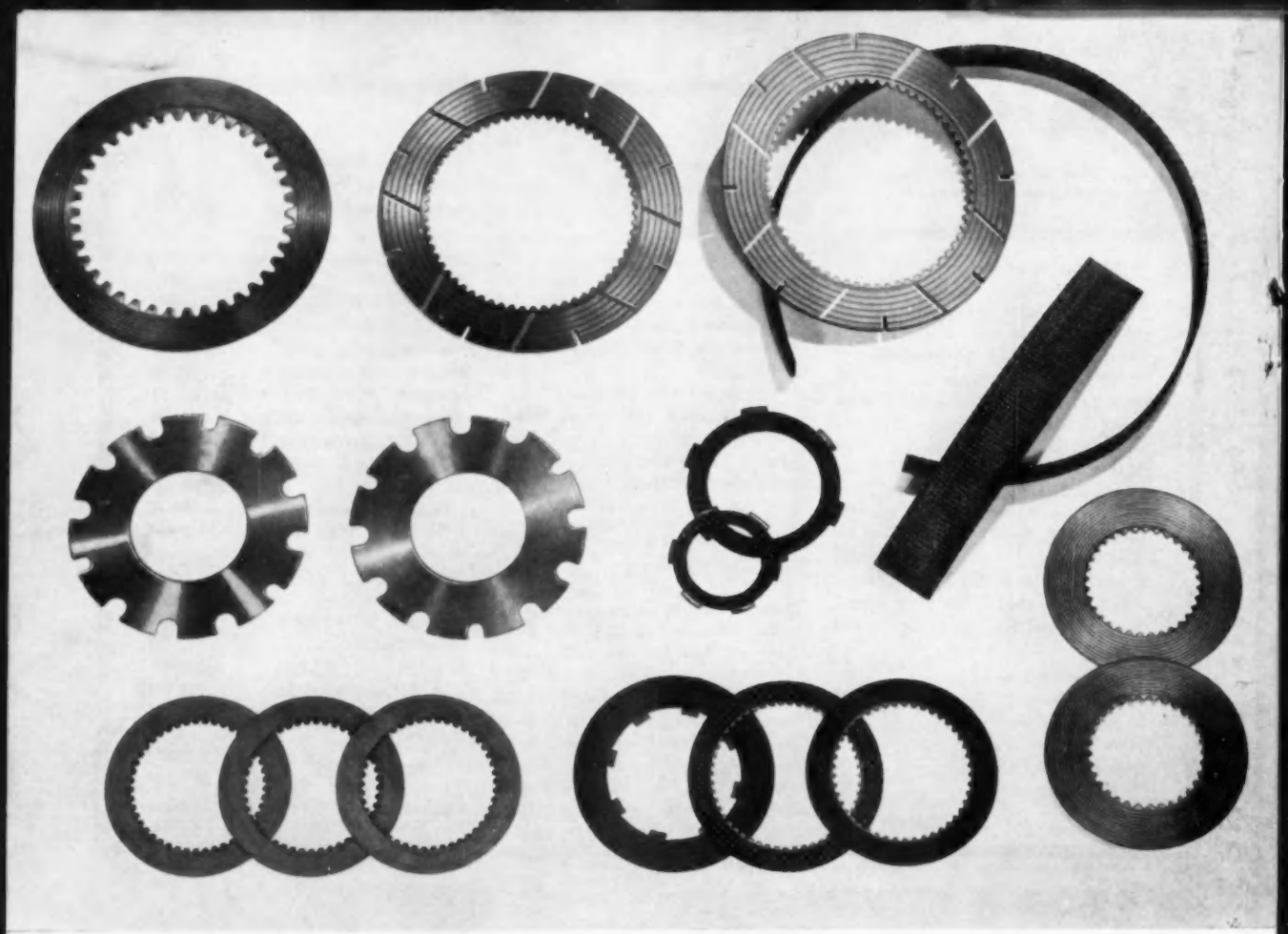
Sheffield Model 840 Precision-Rol matches B. & S. Automatic's high production and precision.

To produce smoother, stronger, more precise threads, straight or tapered, use a Sheffield Precision-Rol. Capacities up to 1½" thread diameter.

Write to Sheffield for Bulletin MU-PR 454, Dayton 1, Ohio, U.S.A., Dept. 4.

7748

the SHEFFIELD corporation



HOW R/M SETS THE PACE IN FRICTION MATERIAL DEVELOPMENT

At work today on friction performance in tomorrow's automatic transmissions

Engineering new friction materials in advance of the need has been standard practice at Raybestos-Manhattan for over 50 years. R/M pioneered development of the friction materials for the first automatic transmission. And today most models of full or semi-automatic transmission for passenger cars—many trucks, too—have one or more R/M friction parts.

With increasingly higher performance standards for modern transmissions, the number of variables to consider in choosing the correct types of friction materials has grown as well. This puts R/M in a unique position to help the O.E.M.

Unlike other manufacturers, R/M works with *all* types of friction materials—sintered metal, semi-metallic, cork-cellulose, and woven and molded asbestos. R/M offers the widest range of friction materials in the industry. And only by choosing from such a wide range can you be certain of choosing precisely the best for your needs.

Remember, R/M's breadth and depth of experience in friction is *your* assurance of improved product performance when you call in an R/M engineer.

Write now for your free copy of R/M Bulletin No. 500. Its 44 pages are loaded with practical design and engineering data on all R/M friction materials.

R M
FIRST IN FRICTION

THE TRADEMARK THAT SPELLS PROGRESS
IN FRICTION MATERIAL DEVELOPMENT

RAYBESTOS-MANHATTAN, INC.

EQUIPMENT SALES DIVISION: Bridgeport, Conn.
Chicago 31 • Cleveland 16 • Detroit 2 • Los Angeles 58

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; Passaic, N.J.; No. Charleston, S.C.; Crawfordsville, Ind.; Neenah, Wis.; Raybestos-Manhattan (Canada) Limited, Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Brake Linings • Brake Blocks • Clutch Facings • Sintered Metal Products • Industrial Adhesives Mechanical Packings • Asbestos Textiles • Industrial Rubber • Engineered Plastics • Rubber Covered Equipment Abrasive and Diamond Wheels • Laundry Pads and Covers • Bowling Balls

NEW

NEW

NEW

ESPECIALLY DESIGNED FOR TOP RING GROOVE PROTECTION IN PISTONS FOR GASOLINE ENGINES

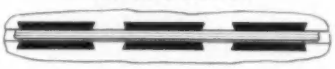
AN ECONOMICAL METHOD WITH MINIMUM WEIGHT INCREASE

CAN BE APPLIED TO ANY TYPE ALUMINUM ALLOY PISTON

PERMA-GROOVE*

WITH SEGMENTAL STEEL TOP RING SECTION

TOP RING SECTION



FRONT VIEW SECTION

CROSS SECTION

Again, Zollner engineering leadership provides another great piston development to engine builders. The new Zollner "Perma-Groove" gives sensationally longer life to pistons and rings, prevents blow-by, minimizes oil consumption. The light weight segmental steel section incorporates high wear resistance in the top ring groove *plus* the advantage of cool operation. Designed especially for gasoline engine pistons, "Perma-Groove" is the quality, low-weight and low-cost companion to the popular "Bond-O-Loc" piston for Diesel engines. We suggest an immediate test of "Perma-Groove" advantages for your gasoline engine.

*T. M. Reg. Pat. App. For

OUTSTANDING ADVANTAGES OF ZOLLNER "PERMA-GROOVE" TOP RING SECTION

1. Individual steel segments eliminate continuous band expansion problem.
2. Segments securely locked to prevent radial movement.
3. Dovetailed edges keep steel segments securely in plane with groove.
4. 75% steel bearing area for wear resistance.
5. 25% aluminum bearing area for heat conductivity and cool operation.
6. Light in weight.

ADVANCED ENGINEERING

PRECISION PRODUCTION

COOPERATION WITH ENGINE BUILDERS

ZOLLNER PISTONS

THE ORIGINAL EQUIPMENT PISTONS

ZOLLNER

ZOLLNER CORPORATION • Fort Wayne, Indiana

Meeting the big change in cars with the big change in bearings:

TIMKEN® and The Moto-Mated Way

How to buy a better bearing at lower cost

THE new Timken® tapered roller bearing above is smaller, lighter, yet has load-carrying capacity to spare. And it saves up to 15% in bearing costs. It's the big change in bearings to meet the big change in cars. Mated to the needs of the automobile industry, it's the product of a whole new concept in bearing design, manufacture and supply—*the Moto-Mated Way*.

Because the new Timken *Moto-Mated* bearings are smaller, they save weight, permit more compact designs. Because they're lighter, they cut unsprung weight, improve the ride. And because Timken *Moto-Mated* bearings are capacity packed, they easily take the loads of today's power cars.

The *Moto-Mated Way* recements the Timken Company's 57-year partnership with the auto industry. It actually anticipates your changing demands. Puts advanced machines to work for you in the world's most modern bearing plant. Guarantees you a virtually unlimited supply of bearings in 13 standardized sizes. Gives you a better product at lower cost.

Already car makers are saving 14.6% in bearing costs by using Timken *Moto-Mated* bearings in millions of front wheels. And you'll save still more as you find new uses for them in rear wheels, pinion and differential.

Now, more than ever, Timken bearings are your No. 1 bearing value. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

QUALITY, SERVICE, PUBLIC ACCEPTANCE MAKE

TIMKEN

TAPERED ROLLER BEARINGS

YOUR NO. 1 BEARING VALUE